SGT-LPN (Digital Microwave Radio)

PDH / Ethernet

Digital Microwave *Radio System*

User Manual

SG-LPN Iss 2.5

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SGT-LPN PDH

DIGITAL MICROWAVE RADIO

USER MANUAL

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ABBREVIATIONS:

Table 1 Abbreviations

Abbreviations	Description
AGC	Automatic gain control
ALM	Alarm
ATPC	Automatic Transmit Power Control
AUTO	Automatic
BBE	Background Block Error
BBER	Background Block Error Rate
BER	Bit Error Rate
BPF	Bandpass Filter
BW	Bandwidth
C/N	Carrier wave/Noise
CIT	Computer Interface Terminal
CV-L	Code Violation Line
dB	dB
DM	Digital Modem
EB	Errored Block
ENT	Enter
Err	Error
ES	Errored Second
ESC	ESC button
ES-L	Errored Seconds Line
ESR	Errored Second Ratio
FD	Frequency Diversity
FLS	Frame Lost
Freq.	Frequency
GLOS	Group Lost
HS	Host Standby
HV	Hardware Version
ID	Identification
IDU / I	Indoor Unit
IF	Intermediate Frequency
IF RSSI	IF Received Signal Strength Indicator
IP	Internet Protocol
LAN	Local Area Network
LCD	Liquid Crystal Display
LED	Light-Emitting Diode

LL	Loop to Local
LR	Loop to Remote
LS	Signal Lost
MAC	Media Access Control
MANU	Manual
Mod/Modem	Modem
Modu	Modulation
NMS	Network Management System
NU	NO Use
ODU/O	Outdoor Unit
PWR	Power
QPSK	Quadrature Phase Shift Keying
RAS	Remote Alarm Signal
Rate	Rate
ReA	Receiving A
ReB	Receiving B
RF	Radio Frequency
RF Po	Radio Frequency Power
RSSI	Receive Signal Strength Indicator
Rx	Receive
RxF	Receive Frequency
S/N	Signal/Noise
SES	Severely Errored Seconds
SES-L	Severely Errored Seconds Line
SESR	Severely Errored Second Rate
Stat	Status
SV	Software Version
TCA	Threshold Crossing Alarm
Temp	Temperature
TRAP	Trap
TRIB	Tributary
Tx	Transmit
TxF	Transmit Frequency
UAS	Unavailable Seconds
US	Use
V/Ver	Version

1 Summary

The **SGT-LPN** is designed using computer-aided design (CAD) and computer-aided manufacturing (CAM) technologies. It incorporates advanced & new technologies which include FPGA, ASIC, frequency synthesizer and assembly modularization, which offer high quality and very reliable Digital Microwave Radio services. The modem uses forward error correction (FEC) to ensure error-free transmission.

SGT-LPN Features:

- Single coaxial cable connection between IDU and ODU;
- Software setup channel configuration;
- IDU can be used at any frequency;
- Automatic Transmit Power Control (ATPC);
- Software adaptive E1's, 10/100BASE-T network interfaces via flexible plug-in modules;
- Local loopback & Remote loopback;
- On-line BER monitor;
- SNMP & WEB access;
- Available with 1+1 protected or 1+0 unprotected configurations;

1.1 Architecture

The **SGT-LPN** uses a split architecture, which consists of 1 IDU, 1 ODU & 1 IF coaxial cable - the IF cable interconnects the IDU & ODU.

1.2 Operating Frequency and Channel Configuration

Table 2 Digital Microwave Radio Operation Frequency and Channel Configuration

Freq Bands (GHz)	Frequency Range（MHz）	T/R Spacing (MHz)	Channel configuration Reference
2	2300~2500	116	
2.4	2400~2483.5	55	
5.8	5725~5850	82	In-band Frequency without interference
7	7125 – 7425	161/154	ITU-R Rec.385-7
	7425 – 7725	161/154	ITU-R Rec.385-7
8	7725 – 8275	311.32	ITU-R Rec.386-6
	7900 – 8400	266	
	8275 – 8500	126/119	
13	12750 – 13250	266	ITU-R Rec.497-5
15	14500 – 15350	420	ITU-R Rec.636
	14400 – 15350	490	

2 SGT-LPN Technical Specifications

Table 3 Technical Specifications

General Specifications							
Freq. Bands (GHz)	5.8	7	8	13	15	18	23
Tx/Rx Spacing (MHz)	82	154/161	119/126/266/311	266	420/490	1008/1010/1092.5	1008/1232
Transmission Capacity	8E1/16E1, N*E1+2*LAN						
Occupation Band (MHz)	3.5/7/14/28						
Modulation	QPSK						
Freq. Synthesizers Step Size (kHz)	250						
Freq. Stability (ppm)	± 10						
System Configuration	(1+0), (1+1) Co-channel standby system, (1+1) Channel hot standby system						
RF Channel Selection	IDU Controlled, or via NMS						
E1 Interface	HDB3; 75Ωhms - Un-balanced, or 120Ωhms - balanced, DB-37						
Ethernet Interface	10/100BASE-T , RJ45						
Power Supply (V)	DC -48V±20%						
Power Consumption (W)	30	35	35	30	30	30	30
RF Interface	N	UBR84/N	UBR84/N	UBR140	UBR140	UBR220	UBR220

Transmitter								
Transmitting IF (MHz)		310						
RF Output Power (dBm)		20/27	25	25	20	20	18	18
ATPC Range (dBm)		+5dBm ~ Maximum						
Receiver								
Receiving IF (MHz)		70						
RF Input Level Range (dBm)		- 20 ~ - 90						
Receiver Threshold (dBm) BER=1E-6	4×E1	-87	-87	-87	-87	-87	-86	-86
	8×E1	-84	-84	-84	-84	-84	-83	-83
	16×E1	-81	-81	-81	-81	-81	-80	-80
Saturate Input Level(dBm)		-10						
Auxiliary & NMS								
Order Wire		1 Channel digital order wire, 3.5mm(1/8 inch) Headset Jack						
Auxiliary Data		19.2kbit/s, RS232C, RJ45						
Software update		115.2kbit/s, RS232C, RJ45						
NMS		100Mbit/s, 10/100BASE-T, RJ45						
Operation System		WIN2000 / WINDOWS NT / WINXP						
Mechanical								
Dimension (mm)		IDU: 48.2 × 44× 26.5 ODU: 26.5x26.5x112 (7/8/13/15GHz), ODU: 30 x 23 x 12.5 (License-exempt Band 2.4/5.8 GHz)						
Weight (kg)		IDU: 3.5 kg ODU: 5kg						
Environmental								
Temperature Range		IDU: 0～+50℃ ODU: -33～+55℃						
Humidity Range		IDU: 20%～90% ODU: Full Range						
Elevation (m)		≤4500						

3 Product Function Description

The **SGT-LPN** PDH Digital Microwave Radio terminals comprise an IDU and ODU. The IDU has two implementations: 1+0 and 1+1. Their heights are the same, 1U. There are two types of ODU: one is a high station (High Band Radio), the other is a low station (Low Band Radio).

3.1 System Structure

3.1.1 1+0 System Structure Block Diagram

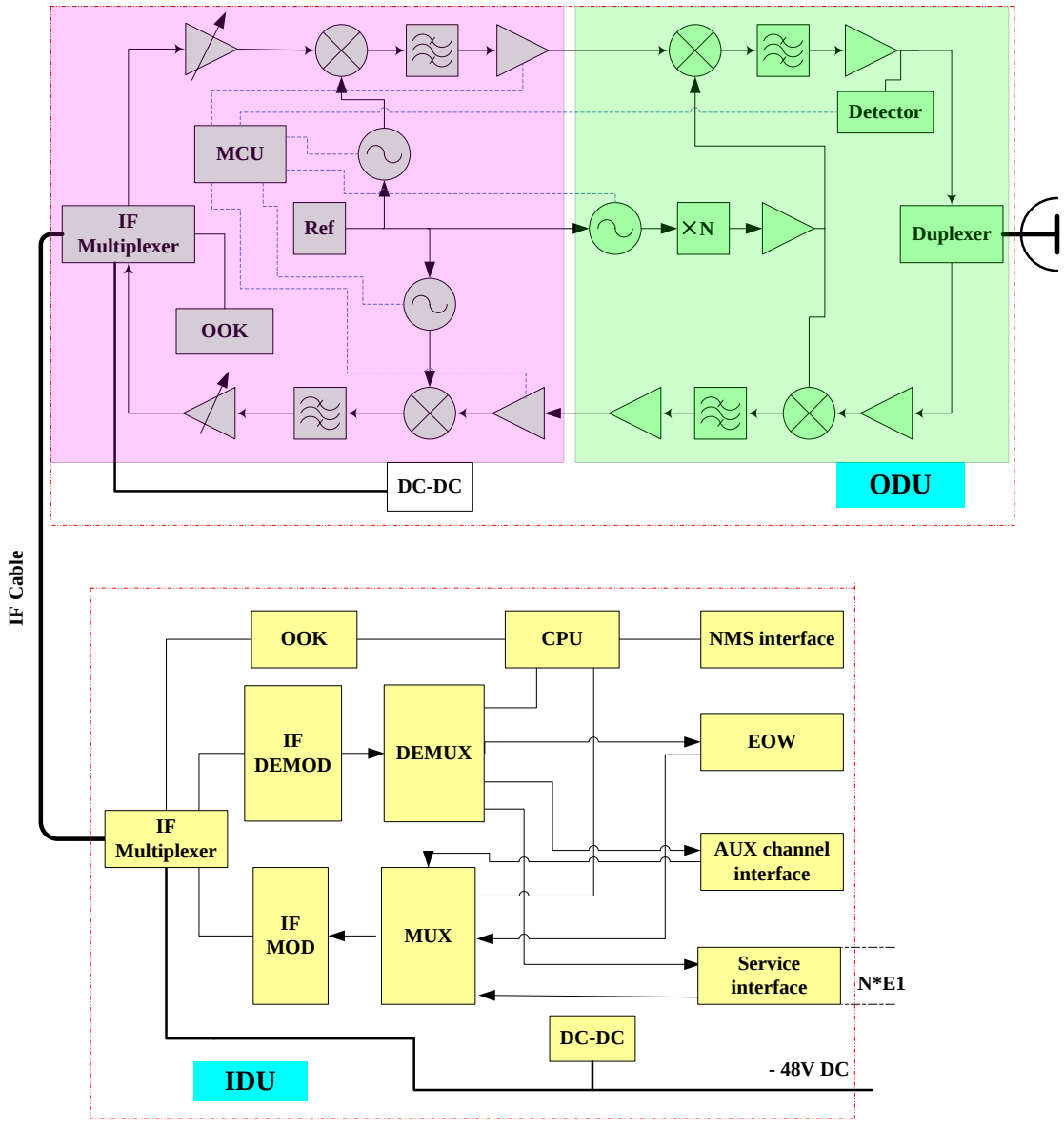


Fig. 1 1+0 System Structure Block Diagram

3.1.2 1+1 System Structure Block Diagram

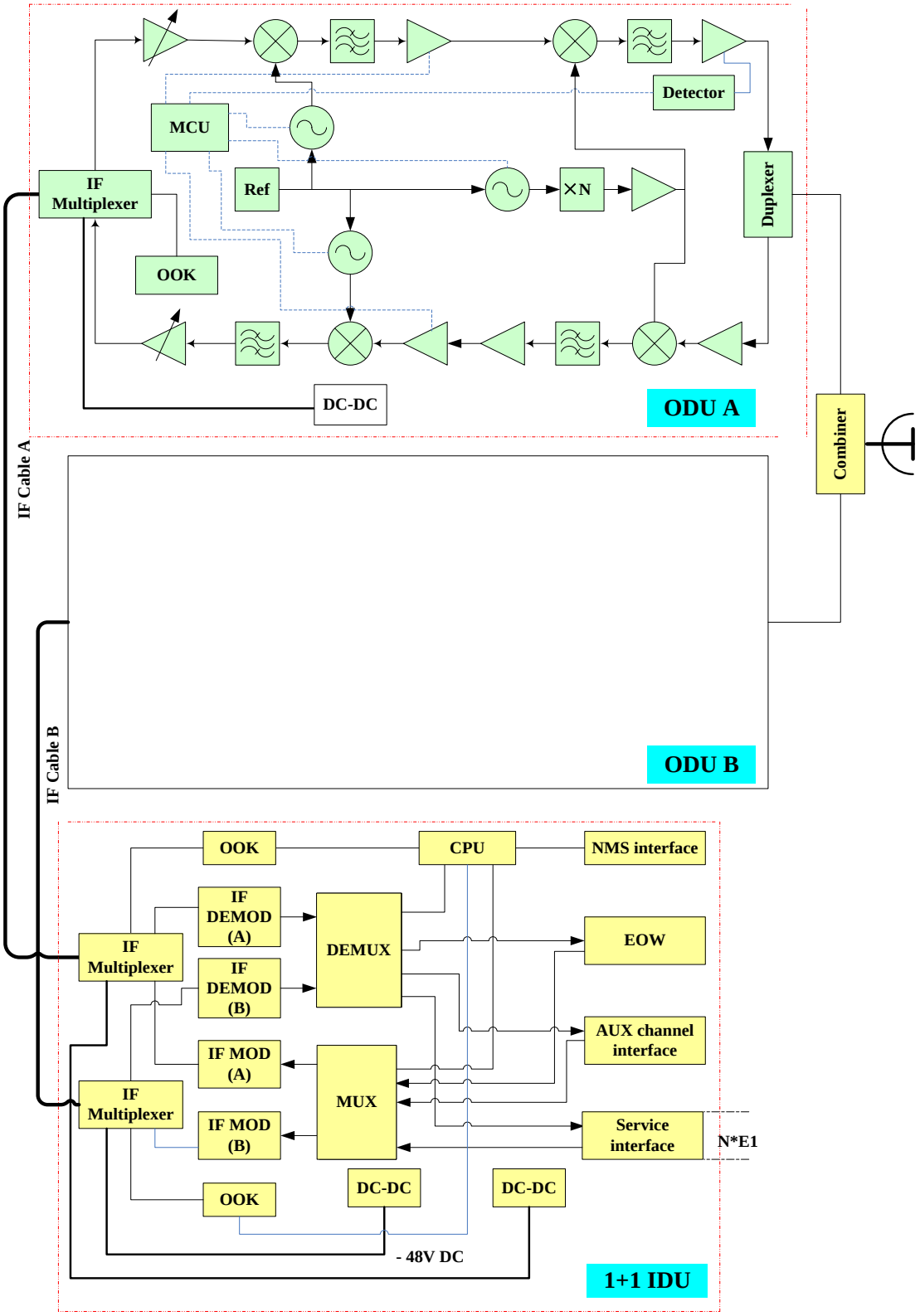


Fig. 2 1+1 Indoor-Outdoor System Structure Block Diagram

3.1.3 1+1 Standby mode

3.1.3.1 1+1 Co-channel hot standby mode

In this mode, the same frequency is used by two systems. Only one transmit signal system is working at any time; the other system is in "hot standby" mode; the main and standby systems receive the same signal at the same time. The switch within the IDU does online/real-time checking: the better-performing link becomes the "main system". When the "main system" fails, the hot standby system switches to become the "main system", automatically or manually. This switch type is a "hit switch". Switching time is less than 50 msec.

3.1.3.1 1+1 Channel hot standby mode

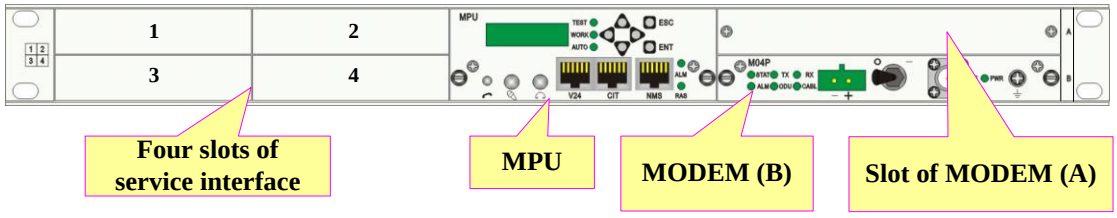
In this mode, the main and the standby systems work using different channels. The Switch unit within the IDU does a real-time BER check and then chooses the better performance channel as the major channel. This process is a hitless switch mechanism.

1+1 Standby mode can operate in a project as follows:

1) Frequency diversity mode: applicable for channel hot standby system
2) Space diversity mode: applicable for co-channel hot standby system and channel hot standby system

3.2 IDU Structure Description

3.2.1 1+0 IDU Main Panel



★The 4 service card slots are flexible, using plug-in functionality.

Fig. 3 1+0 IDU Main Panel

3.2.2 1+1 IDU Main Panel

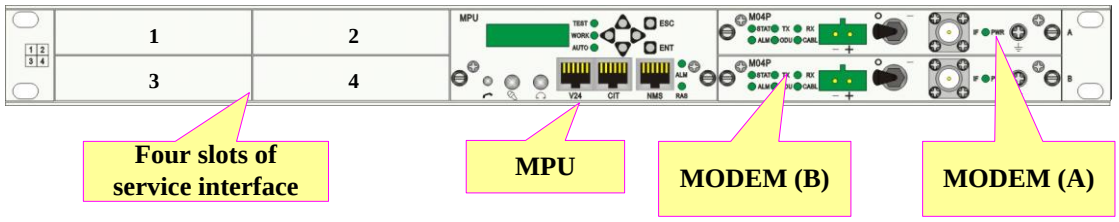


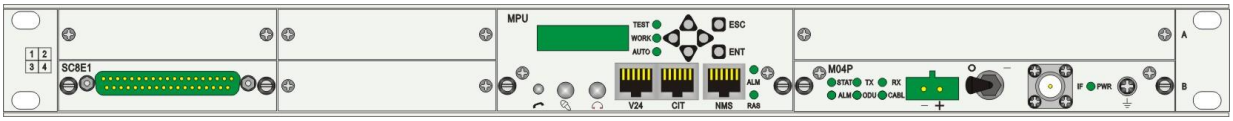
Fig. 4 1+1 IDU Main Panel

★The 4 service card slots are flexible, using plug-in functionality.

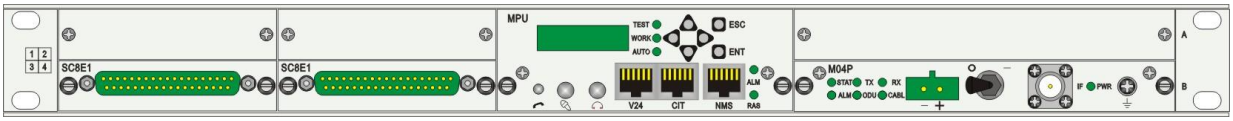
★IF modem A is the same as IF modem B.

3.2.3 Service Card Slot Configuration

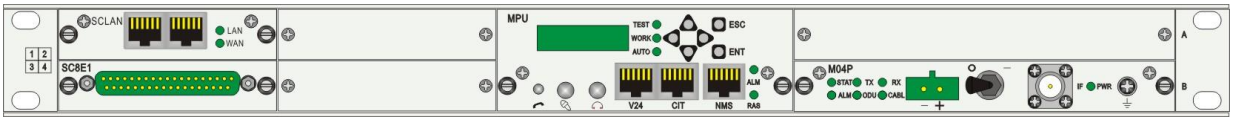
- **2E1/4E1/8E1**



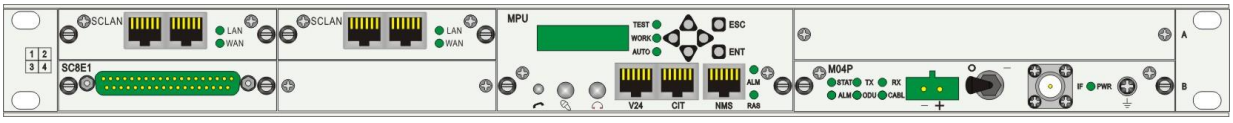
- **16E1**



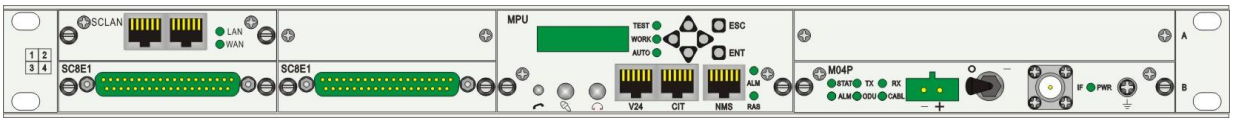
- **(0 ~ 8E1)+LAN**



- **(0 ~ 8E1)+2LAN**

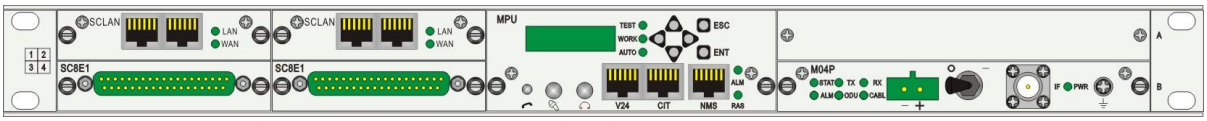


- **(8 ~ 16E1)+LAN**



Note: The maximum capacity is 16E1. If LAN used 4xE1, the capacity left is 12xE1.

- **(8 ~ 16E1)+2LAN**



Note: Maximum capacity is 16E1. If 2LAN used 3xE1 respectively, the capacity left is 10xE1.

Fig. 5 Service Card Slot Configuration

Table 4 Service Card Slot Configuration

No.	Service Card Slot Type	Specifications	Quantity
1	2E1/4E1/8E1	SC 8E1	1
2	16E1	SC 8E1	2
3	(0E1 ~ 8E1) + LAN	SC 8E1	1
		SC LAN	1
4	(8E1 ~ 16E1) + LAN	SC 8E1	2
		SC LAN	1
5	(0E1 ~ 8E1) + 2LAN	SC 8E1	1
		SC LAN	2
6	(8E1 ~ 16E1) +2LAN	SC 8E1	2
		SC LAN	2

3.2.4 1+1 IDU Configuration

The 1+1 IDU configuration is the same as the 1+0 IDU, but the IF modem card number is two (as shown in fig.6):

- **1+1 IDU (8 ~ 16E1)+ LAN**

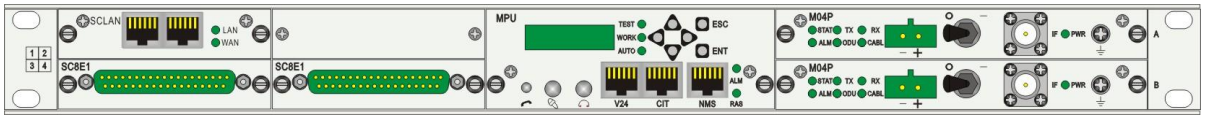


Fig. 6 1+1 IDU (8 ~ 16E1)+ LAN Configuration

3.2.5 IDU Main Panel Description

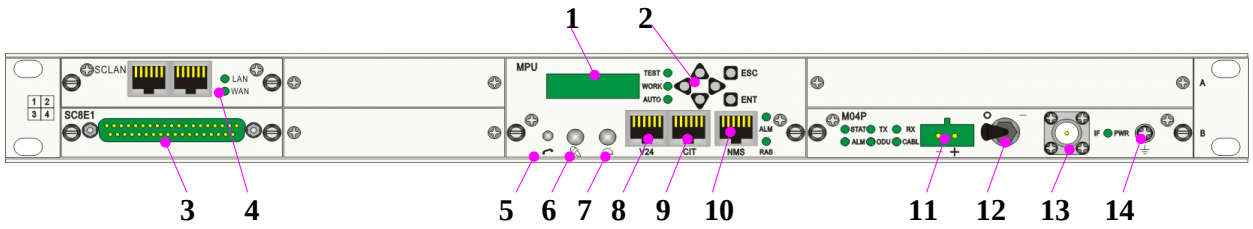


Fig. 7 IDU Main Panel Description

Table 5 IDU Main Panel Description

NO	Item	Description
1	LCD	
2	▲	Up
	▼	Down
	◄	Left
	►	Right
	ESC	Exit
	ENT	Enter
3	8E1 Service Card	DB-37, or 2E1/4E1/8E1
4	LAN Service Card	RJ-45
5	EOW Ring/Silent	
6	EOW Microphone Jack	3.5mm(1/8 inch) mini-headset interface
7	EOW Earphone Jack	
8	V.24 Auxiliary Data Interface	RJ-45
9	Monitoring Interface	RJ-45, (for software update)
10	NMS Interface	RJ-45
11	Power Connector	Supply Voltage : - 48V
12	Power Switch	
13	IF Cable Connector	TNC-KF3
14	Grounding Pole	

3.3 ODU Interface

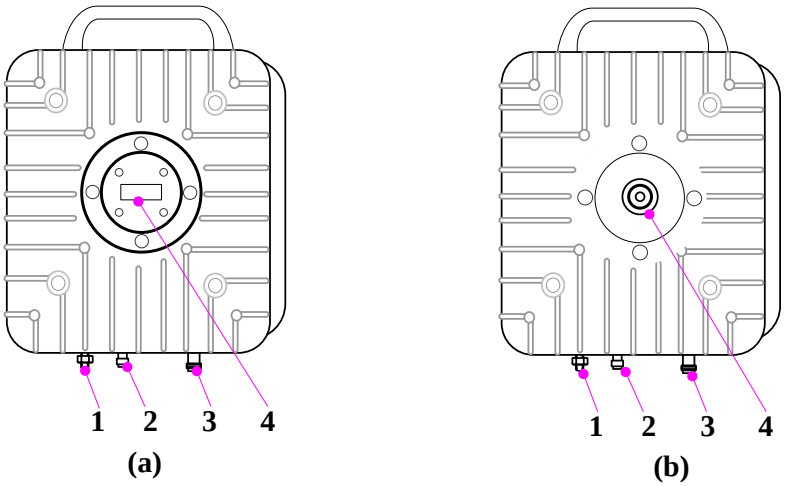


Fig. 8 ODU Interface

Table 6 ODU Interface Description

No	Item	Description
1	GND	Grounding Pole
2	RSSI	Receive Signal Strength Indicator
3	IF	Intermediate Frequency Connector, N (Female)
4	RF Connector	Fig.8 (a) Waveguide Connector, used for 7GHz ~ 23GHz, connecting ODU and Antenna directly
		Fig.8 (b) Coaxial Cable Connector 50Ω N (Female), only for 7GHz and 8GHz, connecting ODU and Antenna through RF Cable

3.4 IF Cable Characteristics

3.4.1 IF Cable Physical Characteristics

Table 7 D-FB Low Loss Foam Coaxial Cable Parameter

	Impedance	Inner Diameter (mm)	Insulation diameter (mm)	Outer Conductor Diameter	Overall Diameter (mm)	Operating Temperature
5D-FB	50Ω	1.8	5.0	5.7	7.5	-25 ~ +70
8D-FB	50Ω	2.8	7.8	8.8	11.1	-25 ~ +70

3.4.2 IF Cable Attenuation Characteristics

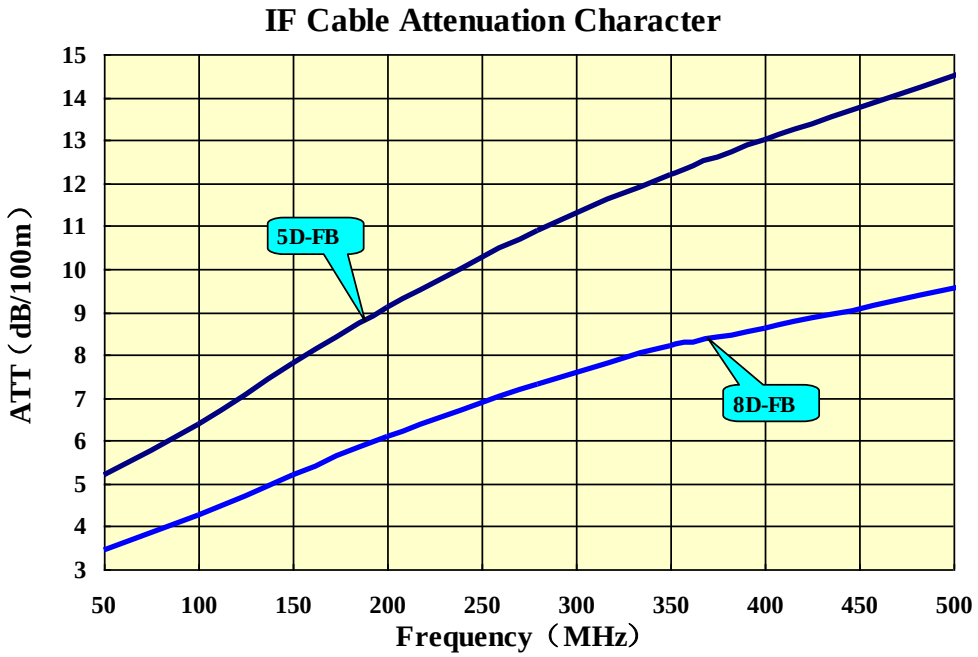


Fig. 9 D-FB IF Cable Transmission Characteristics

- **Notes:**

(1) For IF cable length between IDU and ODU within 150m: 5D-FB cable.

(2) If the IF cable length is longer than 150m, but less than 300m: 8D-FB cable.

3.4.3 IF Cable Signal Transmission

Connect the IDU to ODU with a single cable: traffic signals are illustrated as below:

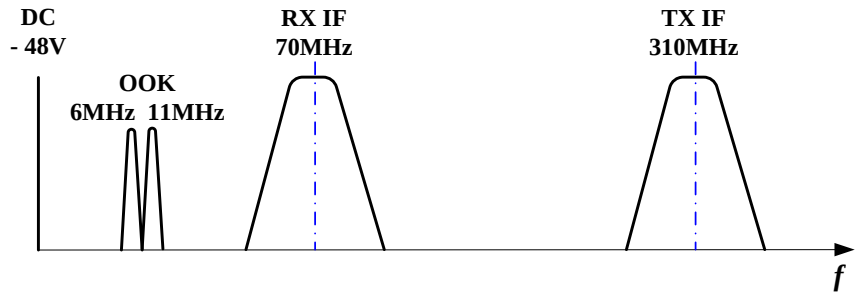
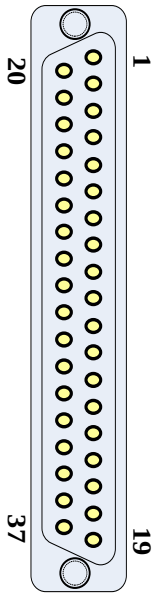


Fig. 10 IF Cable Transmission Signal

3.5 E1 Service Card Connector DB-37 Pin Description

Table 8 8E1 Connecter DB-37 Pin Description

SC8E1 DB-37 Connector	Pin		RJ48	BNC
		**1**	#1E1 Output	Grounding
	20		#1E1 Input	#1E1 Output
		2	#5E Input	Grounding
	21		#5E1 Input	#5E1 Input
		3	#1E1 Input	Grounding
	22		#1E1 Input	#1E1 Input
		4	#5E1 Output	Grounding
	23		#5E1 Output	#5E1 Output
		5	#2E1 Output	Grounding
	24		#2E1 Output	#2E1 Output
		6	#6E1 Input	Grounding
	25		#6E1 Input	#6E1 Input
		7	#2E1 Input	Grounding
	26		#2E1 Input	#2E1 Input
		8	#6E1 Output	Grounding
	27		#6E1 Output	#6E1 Output
		9	#3E1 Output	Grounding
	28		#3E1 Output	#3E1 Output
		10	#7E1 Input	Grounding
	29		#7E1 Input	#7E1 Input
		11	#3E1 Input	Grounding
	30		#3E1 Input	#3E1 Input
		12	#7E1 Output	Grounding
	31		#7E1 Output	#7E1 Output
		13	#8 E1 Input	Grounding
	32		#4 E1 Output	#4 E1 Output
		14	#4 E1 Output	Grounding
	33		#8 E1 Input	#8 E1 Input
		15	#4 E1 Input	Grounding
	34		#4 E1 Input	#4 E1 Input
		16	#8 E1 Output	Grounding
	35		#8 E1 Output	#8 E1 Output
		17	Grounding	Grounding
	36		Grounding	Grounding
		18	Grounding	Grounding
	37		Grounding	Grounding
		19	Grounding	Grounding

3.5.1 Unbalanced E1 Connector Accessory Description

- **DB-37 To BNC Convertor Plate**

The height of the plate which converts DB37 into BNC is 1/2 U. The plate offers 8 E1 ports. In the case of 16 E1, two connector plates will be used.

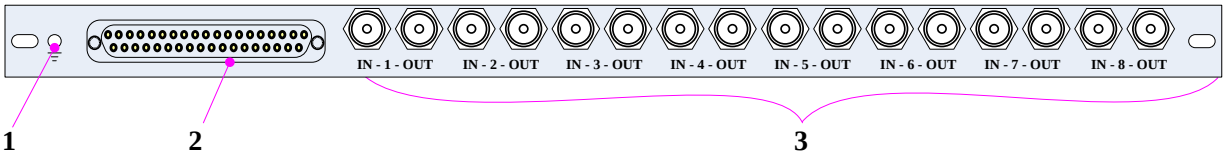


Fig. 11 DB37 to BNC Convertor Plate Illustration

Table 9 DB37 to BNC Convertor Description

No	Item	Description
1	DB37 Jack	
2	8 Pairs of BNC (Female) Coaxial Cable Convertor	IN —— E1 Input (From Terminal)
		OUT —— E1 Output (To Terminal)

- **DB-37 To Coaxial Cable Illustration**

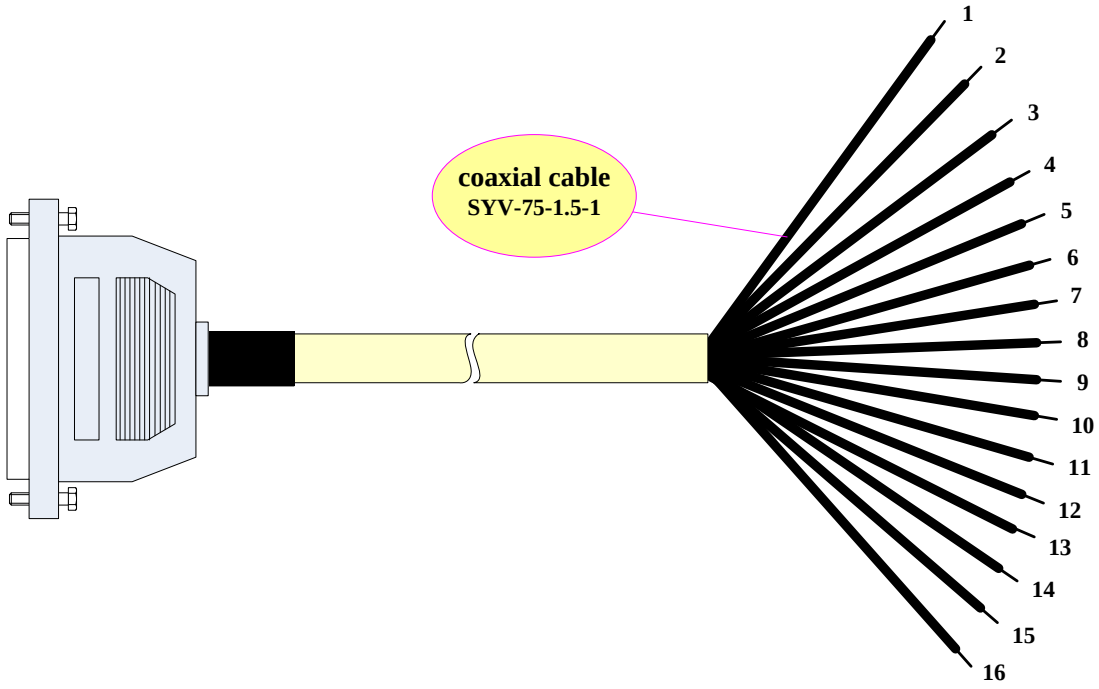


Fig. 12 DB37 To Coaxial Cable

Table 10 DB-37 to Coaxial Cable Description

Wire No	# E1	Description
1	#1 E1	The odd numbers for IN (to IDU) The even numbers for OUT (from IDU)
2		
3	#2 E1	
4		
5	#3 E1	
6		
7	#4 E1	
8		
9	#5 E1	
10		
11	#6 E1	
12		
13	#7 E1	
14		
15	#8 E1	
16		

For 16 E1, use two cable set.

3.5.2 Balanced E1 Connector Accessory Description

- **DB-37 To RJ-48 balanced E1 Interface Plate**

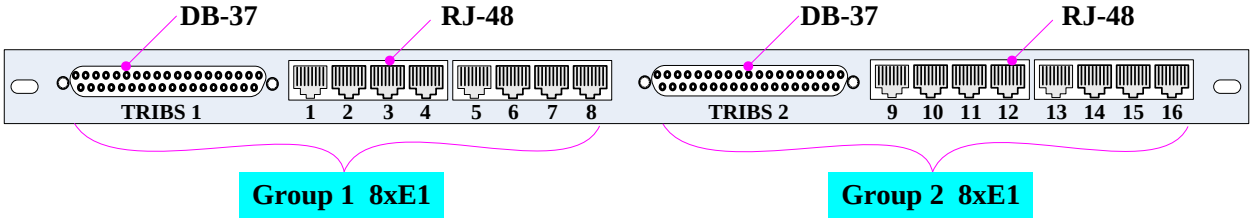
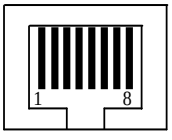


Fig. 13 DB37 to RJ48 balanced E1 Interface Plate Illustration

Table 11 RJ 48 Balanced E1 Interface Pin Description

Designation	Jack Type	Pin	Symbol	Description
Balanced Interface	RJ-48 Jack 	1	RXRINP	Receiving data
		2	RXTIG	Receiving data
		3	Un-named	
		4	TXRINP	Transmitting data
		5	TXTIG	Transmitting data
		6	Un-named	
		7	Un-named	
		8	Un-named	

- **DB-37 To Twisted-pair**

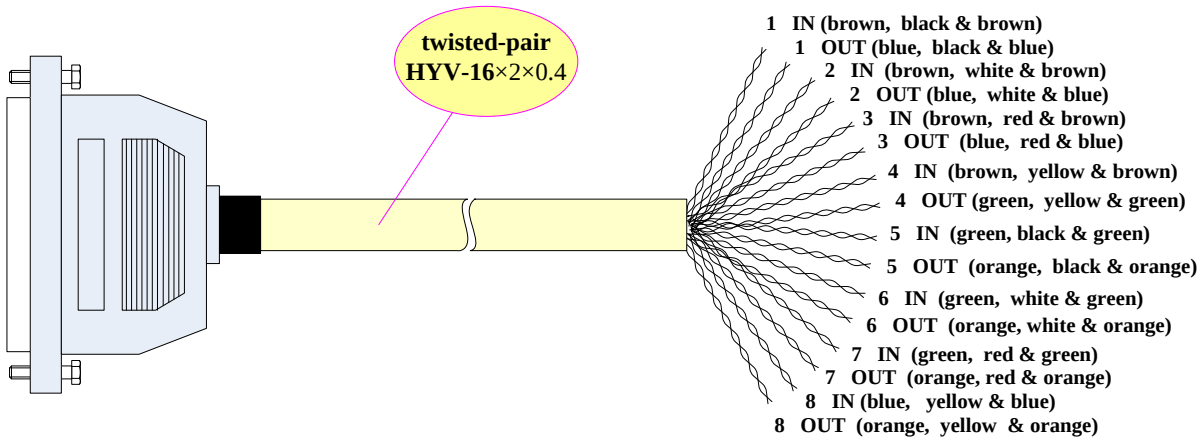

twisted-pair
HYV-16×2×0.4
1 IN (brown, black & brown)
1 OUT (blue, black & blue)
2 IN (brown, white & brown)
2 OUT (blue, white & blue)
3 IN (brown, red & brown)
3 OUT (blue, red & blue)
4 IN (brown, yellow & brown)
4 OUT (green, yellow & green)
5 IN (green, black & green)
5 OUT (orange, black & orange)
6 IN (green, white & green)
6 OUT (orange, white & orange)
7 IN (green, red & green)
7 OUT (orange, red & orange)
8 IN (blue, yellow & blue)
8 OUT (orange, yellow & orange)

Fig. 14 DB37 to Twisted-pair

Table 12 DB37-TP E1 (120 ohm balanced) cables

E1 number	E1 interface	Colour of twisted-pair	DB37 pins
1	IN	brown, black & brown	3, 22
	OUT	blue, black & blue	1, 20
2	IN	brown, white & brown	7, 26
	OUT	blue, white & blue	5, 24
3	IN	brown, red & brown	11, 30
	OUT	blue, red & blue	9, 28
4	IN	brown, yellow & brown	15, 34
	OUT	green, yellow & green	14, 32
5	IN	green, black & green	2, 21
	OUT	orange, black & orange	4, 23
6	IN	green, white & green	6, 25
	OUT	orange, white & orange	8, 27
7	IN	green, red & green	10, 29
	OUT	orange, red & orange	12, 31
8	IN	blue, yellow & blue	13, 33
	OUT	orange, yellow & orange	16, 35
Annotation: IN — E1 signal input (from terminal equipment) OUT — E1 signal output (to terminal equipment)			

3.6 Ethernet Connector Description

Table 13 Ethernet Connector Functional Description

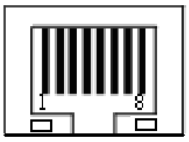
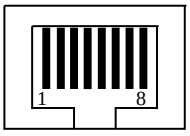
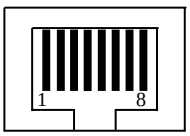
Item	Description
Ethernet connector	IEEE802.3 is implemented with 2 LAN connectors, RJ45 with LEDs.
Auto-negotiation	All LAN interfaces with Auto-negotiation, Auto select 10/100Mbps, half-duplex and full-duplex modes, completely fulfill the Auto-negotiation functions of IEEE802.3/802.3u.
Crossover wire test	Auto test crossover wire, supports crossover wire and straight-through wiring.
Switching function	There is a Fast Ethernet switching function between the 2 LAN interfaces; the switch rate is 100Mbps. Data of the 2 LAN interfaces passes through the switch function first, following which there is a determination of which site (local or remote) to transmit to. These 2 LAN interfaces are not independent; they will share the occupation band.
Maximum transmit unit	1552Byte
VLAN/QoS	Fully transparent for VLAN and QoS Tags.
Broadcast storm control	Support for broadcast storm congestion control.
Data transmission characteristics	High efficiency network data transmission: can buffer a large amount of data.

Table 14 Ethernet Interface LED Status Description

Items	Status	Description
Ethernet LED (green)	On	Network physical link connect
	Off	Network physical link disconnect
	Flash	Network data transmission
Ethernet LED (yellow)	On	For the connection, access medium rate is 100Mbps
	Off	For the connection, access medium rate is 10Mbps
WAN	On	Remote IDU LAN link is normal
	Flash	Receive remote IDU LAN data
LAN	On	Local IDU LAN link is normal
	Flash	Transmit local IDU LAN data

3.7 Auxilliary Interface Pin Description

Table 15 RJ45 Jack Pin Description

Interface	Type	Pin	Symbol	Description
NMS 100BASE-T	RJ-45 	1	TPTX+	Positive output
		2	TPTX -	Negative output
		3	TPRX+	Positive input
		4	N/ C	Not used
		5	N/ C	Not used
		6	TPRX -	Negative input
		7	N/ C	Not used
		8	N/ C	Not used
RS232	RJ-45 	1	TXD	RS232 output
		2	TXD	RS232 output
		3	RXD	RS232 input
		4	RXD	RS232 input
		5	N/C	Not used
		6	N/C	Not used
		7	GND	Grounding
		8	GND	Grounding
V.24	RJ-45 	1	GND	Grounding
		2	N/C	Not used
		3	GND	Grounding
		4	RXD	Data input
		5	TXD	Data output
		6	GND	Grounding
		7	N/C	Not used
		8	GND	Grounding

4. Operating Description

4.1 IDU Panel Operating Description

IDU panel consists of 1 LCD, 10 LED indicators and 6 buttons. The LCD can display using two lines with 16 characters / per line. The IDU panel is used for supervision and surveillance of system parameters and operating status of the SGT-LPN.

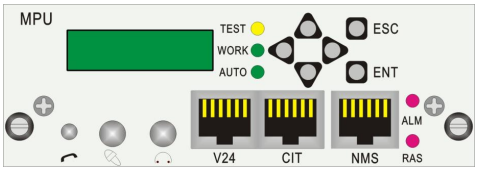


Fig. 15 LCD Panel Illustration

- **IDU Operation Buttons:**

Table 16 IDU Operation Buttons

Symbol	Name	Function		Beeping
		Status	Result	
▲	UP	Page up	Increase	➢ Operation is successful: Beep once ➢ Operation fails: Beep twice
▼	DOWN	Page down	Decrease	
◄	LEFT	Page left	Cursor left	
►	RIGHT	Page right	Cursor right	
ESC	EXIT	Home	Cancel modify	
ENT	ENTER	Setup	Ensure modify	

Table 17 LCD Indictor Description

LED	Description	Off	On
TEST	Loop back	OK	(**yellow**) Loop back testing (testing in user card light off)
WORK	CPU	IDU fault	(**green**) Flash 1 time/ sec. (if not failure)
AUTO	Operating mode	Man/1+0	(**green**) 1+1/ Auto
ALM	IDU Alarm	OK	(**red**) IDU alarm
RAS	Remote alarm	OK	(**red**) Remote alarm

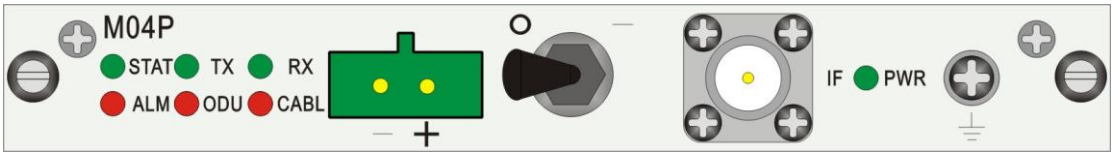


Fig. 16 Modem Panel Illustration

Table 18 Modem LED Description

LED	Description	Off	On
STAT	Status indictor	For 1+1, standby	(**green**) Working
TX	IF transmitting	Transmitting level lower	(**green**) TX level OK
RX	IF receiving	Receiving level lower	(**green**) RX level OK
ALM	Modem alarm	OK	(**red**) Modem alarm
ODU	ODU alarm	OK	(**red**) ODU alarm
CABL	IF failure alarm	OK	(**red**) Cable fault

- **LCD Panel Operation**

  There are two operating statuses for LCD panel operation:

  - View function
  - Modify function

  The statuses are different operationally, as per the following descriptions:

  a. View function

  The system enters the display status mode after power on. In this situation, pressing **▲, ▼** will scroll the screen UP or DOWN; pressing **◄, ►** will scroll the screen LEFT or RIGHT. If it does not work, there will be two beeps. After pressing **ESC**, the display will be the home page.

  In the view function, the values of parameter will be refreshed every two seconds. And the values will be displayed as "xxx" if the values are not valid.

  If the item has options for selecting or modifying, the cursor will flicker – the user can then use **▲**, **▼**, **◄**, **►**for choice. Pressing ENT, enters into the "modify status" mode: by using direction button, the user can select or modify the parameters. After modifying the parameter, press **ENT** again to finish the setting.

b. Modify Function

Generally, a new product will be set to default parameters after manufacturing. The parameter changing will be done in the "modify mode." If we press **ENT** after making no changes or we press **ESC** after changing something, the system will maintain the default values and exit the modifying mode.

We can use **◄, ►** to choose parameters and use **▲, ▼** to change the parameter. After finishing the setting of a parameter, press **ENT** to make your selection; then proceed back to the view function.

In the case of password protection, modifying is allowed just after entering the password. Hold **ENT** for 5 seconds – this leads to the password screen; then enter a password. After 30 minutes with no activity or entering the wrong password, the password will be treated as invalid.

- **LCD Display Manual**

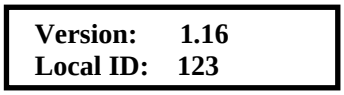
After an hour, if nothing has happened on the LCD, the power of the LCD will be switched off to protect the LCD. In this status, after pressing any button, the LCD will display again. Occasionally, if the LCD working is not working correctly, pressing **ESC** 6 times will reset the LCD to allow normal operation.

4.1.1 Equipment ID and Menu Option

4.1.1.1 LCD Menu Selection

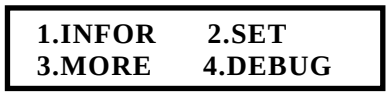
LCD screen display is described as below:

The initial page is displayed after powering on, or pressing the **ESC** button on another screen. Press the DOWN button to show the next page. When alarms occur, push ENT in this screen; the screen will jump to an alarm screen to allow the user to determine what happened.



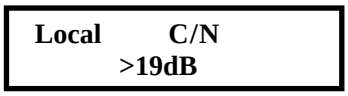
This page displays equipment type, software version, local or remote equipment ID. The

ID is used for identifying equipment; it can be modified by user. The equipment ID code is the same as the last number of the IP address of the IDU. The IP address will be modified after modifying equipment ID code. Vice versa, the equipment ID code will be modified after modifying the IP address.



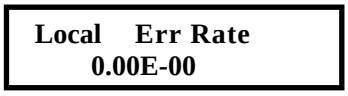
This page displays the menu: INFOR for the status message screen, SET for editing the message page, MORE for a more detailed message page and DEBUG for equipment testing message page (only for testing status). Move the cursor to one item, and press the ENT button to proceed to the required screen.

This PAGE displays the IF RSSI level: the normal range is **0 ~ -20dBm.** Press the ◄ or ► button to view the remote message.

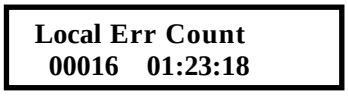


This PAGE displays the C/N of the IF received signal in the IDU. The larger the value, the better the signal quality.

This page displays the Err Rate for the local receiving side. Press ◄ or ► to view the remote side.

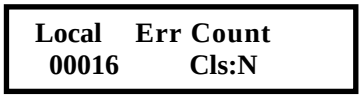


This PAGE display the current Local Err Rate; normal Err Rate < 1.00x10-11

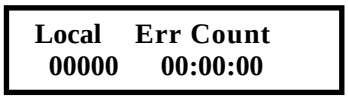


This PAGE displays the error bit count. The error bit number displays between 0 and 65535. Err counting time is from 0-99 hours. The time unit is a second. After pressing

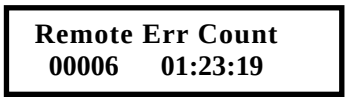
ENT, the user can clear the Err count number (which returns the count to zero and restarts the count.)



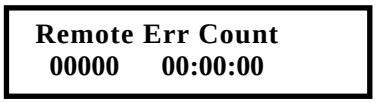
Press UP or DOWN to change "N" into "Y" , then press **ENT** to clear the Err Counter : it show as



It shows the above screen to restart Error counting on Local.



On the Local Err Count page, press the RIGHT button to show the receive Err count on the remote.



When clearing the remote Err count, local Err counting will be cleared at the same time, so this process can restart Err counting simultaneously for both sites.

The above display shows the transmitting and receiving radio frequency on the local ODU. If there is a failure to read data, the information displays as "xxxxxx".

The above screen shows the received signal strength indication on the Local ODU.

It above screen shows **RFPo** on the Local ODU.

```
Local ODU Loc
RF:L   Tx:L   Rx:L
```

The above screen shows the local ODU RF and IF local oscillator's lock statuses. RF means radio frequency local oscillator, Tx means intermediate frequency local oscillator for transmitting, Rx means intermediate frequency local oscillator for receiving. "L" represents lock, "N" represents no lock (unlocked), "X" represents a failure to read ODU data.

```
Local   Loop Back
        Normal
```

The above screen shows the local loopback test option

Normal: No loop back

Frame: Frame loop back; signal from the "service card" is to be sent to the main board and build a frame and then looped back.

Port: Loopback between the service card and IDU main board port; test whether or not the connection is correct.

IDUIF: IDU IF loopback.

4.1.1.2 E1 Interface Information

Service cards include the 8E1, DB-37 and 120Ω balanced jack. If needing to choose the 75Ω un-balanced jack, the user can use the DB-37—BNC converter plate or the DB-37—coaxial cable.

```
Local    E1-1   Alm
1FLS 2FLS 3FLS 4FLS
```

The above screen shows alarm messages for E1's. 4xE1 display in one screen, for one service card (SC8E1) includes 8xE1 and needs two screens. Serial no. of E1 (1~8) displays on a second line. Slots 1, 2, 3, and 4, which insert SC8E1, are shown as E1-1, E1-2, E1-3, E1-4.

Press ◄ to change the local or remote site; press ► to change slots, service card. If any slot is not used, it will be not be displayed or the display will be empty. If the service card does not monitor signals, it will not display TLS alarms.

E1 alarm message

FLS — frame loss alarm

RAS —remote alarm

TLS — signal loss alarm

```
Local    E1-1 Stat
1IN 2LS 3NU 4LR
```

The above screen shows the service card signal situation; first 4 tributaries signal status of E1 in slot 1 as below:

IN: signal is fed into the tributary

LS : signal is lost

NU: out of use, (the alarm monitoring system is not monitoring lost signal)

LR: loop back to remote, no monitoring signal

4.1.2 System Parameter Setting

From the LCD menu, the user can setup (or modify) system parameters of the local or remote site. The procedure entails first choosing the SET item in the main menu and pressing the ENTER button; then go into setup or modify operation to set parameters.

- **Protection Setting**

```
Local          Protect
Auto   HS   ReA   TrB
```

The above screen shows the 1+1 Protection setup. **AUTO** for automatic, **MANU** for manual, **HS** for co-channel hot standby, **FD** for channel hot standby, **ReA/ReB** is used for the receiving signal from the modem panel A or B, **TrA/TrB** is used for the transmitting signal from the modem panel A or B.

When the local site and remote site are connected, set up local data; the remote data will be changed automatically.

- **Loopback Setting**

```
Local    loop back
         Normal
```

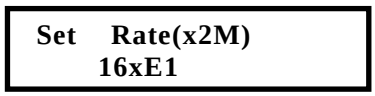
Used for testing devices, the default is "normal". If needing to setup a loopback, press ENTER; then use the UP or DOWN button to setup the items; then press ENTER again to finish. This kind of setup is volatile.

Note : loopback test will break communication signals in the service interface.

Table 19 Loopback Term Description

Name	Description
Normal	No loop back, normal
ODU-R	Remote ODU loopback (need ODU support)
ODU-L	Local ODU loopback (need ODU support)
Port	Service card and MPU interface loopback; checks connection status
Frame	Frame loopback
IDU IF	IDU IF loopback

- **E1 Interface Setup**



The above screen shows only for the SC8E1 rate setup. There are 4 service interface slots in the SGT-LPN IDU. The software order is from 1 to 4. If a slot is not used, no capacity will be distributed on this slot. The ports of each SC8E1 are configured from 1 to 8; if the capacity is not enough, the higher no. port will not be configured. The capacity of the E1 can be set to 2E1, 4E1, 8E1, 16E1. After settings are done, the transmission capacity will be adjusted and implemented.

For the local setup, the IDU will distribute capacity according to the position of the SC8E1. If transmitting and receiving channels are connected, the remote site will follow the local site settings automatically, even if the remote site has no SC8E1 board. In order ensure that the configuration is suitable; before local setup, the user must make sure that both site's SC8E1 boards are in the same slot number.

When the transmitting and receiving channel is connected, if the rate is changed and the communication is broken, the system will recover the original rate.

After rate setup, the capacity distribution data is nonvolatile.

Note: If the transmitting and receiving channels are connected and both sites can read remote datum, but service interface does not work: then, in this case, the reason is the capacity or SC8E1 slot number between both sites does not match. If the user resets capacity on one site, it will recover communication between the sites.

- **E1+LAN Interface Setup**

```
Rate (x2M) ALL:16
LAN1:6     LAN2:2
```

The above display shows the configuration of 8E1+2LAN:"**Rate (xE1)**" for several E1, "**ALL:16**" for total of 16E1 capacity, "**LAN1:6**" for the first LAN with 6E1, **"LAN2:2**" for the second LAN with 2E1, the others with 16-6-2=8(E1), (i.e. 8E1).

As long as the LAN service card (SCLAN) is in the slot, the rate setup screen is shown as above. The first setup is the total rate (ALL); the second setup is LAN rate, ALL-LAN rates as based on an integral multiple of the E1 rate.

For the difference between local and remote site: refer to "E1 interface setting".

- **LAN Interface Setup**

```
Rate (x2M)  ALL:16
LAN1:8      LAN2:8
```

The above screen shows only for LAN. This setup is the same as "**E1+LAN**", but for E1 (E1=0).

- **Channel Operating Frequency Setting**

A. 1+1 FD

```
Set ODUB Tx_Freq
  14641000kHz
```

```
Set ODUA Tx_Freq
  14529000kHz
```

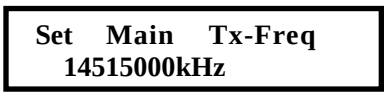
Setup channel A and channel B transmit frequencies, where both channels do not interfere with each other. The above screen shows configuration of a 15G ODU transmitting frequency (Tx). This system only sets up transmitting frequency (Tx); the receiving frequency (Rx) will follow Tx automatically. By pressing the "left", "right" buttons, the user can check Rx. Tx and Rx parameters are saved in the IDU; they are nonvolatile. When whole system or ODU powers up, or the ODU has lost its frequency, the IDU will automatically setup the ODU. When transmitting and receiving channels are connected, the setup of local operating frequency and remote operating frequency will be setup

automatically. If the channel does not work after a change to the frequency setup, it will go back to the original frequency automatically.

When transmitting and receive channels are disconnected, there is a need to setup on both sites; the remote Tx should be the same as the local Rx.

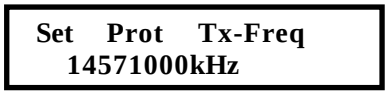
B. 1+1 HS

- **Main Channel Operating Frequency Settings**



In the co-channel hot standby situation, the two channel operating frequencies are the same. They are both the main operating frequency. The above screen shows the configuration of the 15G ODU transmit frequency (Tx). This system only sets up transmitting frequency (Tx); the receive frequency (Rx) will follow the Tx automatically. By pressing the "left", "right" button can check the Rx. Tx and Rx parameters are saved in the IDU; they are nonvolatile. When the whole system or an ODU powers up, or an ODU has lost its frequency, the IDU will automatically setup the ODU. When transmitting and receiving channels are connected, the setup of the local operating frequency and remote operating frequency will be done automatically. If the channel does not work after a change to the frequency setup, it will go back to the original frequency automatically. When transmitting and receive channels are disconnected, there is a need to setup on both sites; the remote Tx should be the same as the local Rx.

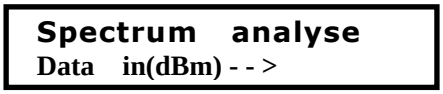
- **Standby Channel Operating Frequency Setting**



The Standby operating frequency is the B channel operating frequency when the operating mode changes from HS to FD. If this frequency is not setup, the switches will disconnect the Tx and Rx signal and will lose remote site control. If use of this switch is not needed, the frequency does not need to be setup.

The setup method is the same as for the main operating frequency, but the operating frequency is for a different channel.

- **Spectrum Analyser**



The Spectrum Analysis function is for a 5.8GHz radio where there can be more interference in the band. When one does spectrum analysis at a local site, the remote terminal's transmitter is switched off temporarily. The local terminal will do spectrum analysis, starting from the lowest frequency. The analysis results displayed under the frequency line are the receive signal levels corresponding to remote site's transmit frequencies displayed on the LCD. The same analysis is done at the Remote site. If the remote terminal is not powered off when the local terminal is doing spectrum analysis, the analysis results of the local site and the analysis of the remote site will be displayed alternately every 2 seconds. One can choose a frequency with low receive (noise) signal as the transmitting frequency for the remote terminal. Please check the sequence number of the configured frequency and set the remote transmit frequency to have the same sequence number in the frequency list. Or, please use ► to check the receive frequency at the local site corresponding to the configured transmit frequency. Then set that frequency as the transmit frequency of the remote terminal.

- **E1 Service Interface Tributary Setting**

E1 service interface tributary setup:

US —— in use, monitoring the tributary signal: if the E1 signal is not connected, there will be a lost signal alarm (displayed on the service card signal status screen).

NO —— not being monitored for alarm purposes.

LR —— remote loop back: if connected to a BER instrument, the BER instrument can test the channel.

LL —— local loop back: the BER instrument can test local site.

LR and LL only affect one tributary loop back: it will not influence other tributaries or links. The setting is nonvolatile. When it is set for loop back, the TEST light will be off.

- **Transmit Power Setting**

```
Local    RFPo Set
 +17dBm    ON
```

This menu has two items. The left item is the transmission power (Po) level. The right item is the Po switch. The range of ODU Po is limited; if the set amount is too small or too large, the required Po will be unavailable. The functionality of Po level is available when the remote site's ATPC is off, otherwise Po is being controlled by ATPC.

ON —— Po on.

OFF —— Po off.

This setting is nonvolatile.

Note: If Po is off, the communication will be disconnected and use user/terminal will not control the remote site.

- **ATPC Setting**

```
Local    ATPC Set
 -060dBm     ON
```

This menu has two items. On the left is the ATPC level, on the right is the ATPC ON/OFF software switch. This function compares RSSI with ATPC level with control remote Po, in order to achieve a RSSI within the ATPC level range of ± 5dB. ATPC is controlled by an ON/OFF software switch.

- **Bit Error Rate Alarm Setting**

```
Local BER Alarm
      > 1E-6
```

This item is for setting the bit error rate (BER) threshold (the value is 1×10^{-6}.) When BER exceeds the threshold, the IDU will display a BER alarm.

- **RFPo Alarm Setting**

```
Local    RFPo ALM
      00.0dBm
```

Setup RFPo alarm threshold; if RFPo level is less than the threshold, the system will send an RFPo alarm signal.

- **RSSI Alarm Setting**

```
Local RSSI ALM
      -080dBm
```

Setup RSSI alarm threshold; if RSSI less than the threshold, the system will send a RSSI alarm signal.

- **Alarm Type Setting**

```
J-LCD Alarm:OFF
 Beep Alarm:OFF
```

There are two kinds of alarm type, one is the jump screen (J-LCD), the other is beeping. When the J-LCD is ON, if an alarm happens or there is no action on screen for more than 20 seconds, the screen will jump to the respective alarm-related screen and the back light will flash. If the user needs a long time period to monitor a screen, J-LCD should set as OFF. When the beep alarm is on, detection of an alarm will lead the buzzer to sound 4 short and 1 long beeps. All above alarm setting are nonvolatile.

4.1.3 Detailed Information Display Settings

4.1.3.1 Menu Item

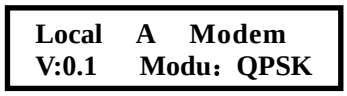
In the menu screen, choose **MORE** for detail information setup; the user can then check detailed information.

```
1.MODEM   2.ODU
3.MpuSC   4.OTHER
```

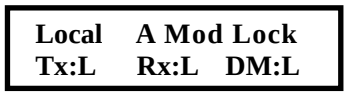
In the detail information menu, there is: **MODEM** for MODEM status information (which cannot be modified), **ODU** for ODU status information (which cannot be changed). **MpuSC** for service card and MPU card status information. **OTHER** for auxiliary information, which cannot be changed. Move the cursor to the

chosen item and press ENT to enter and see more information.

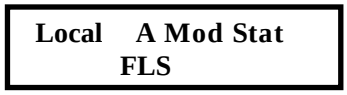
Information can be displayed using the RIGHT button (switch A, B channel and slots) and the LEFT button (switch local and remote).



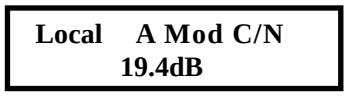
The above screen displays the MODEM's version and modem modulation method.



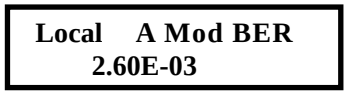
The above screen shows Modem A local oscillator frequency lock status, **Tx** for transmit IF local oscillator frequency, **Rx** for receive IF local oscillation frequency, **DM** for digital demodulator lock status. "**L**" for lock, "**N**" for un-lock, "**x**" for no information.



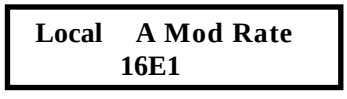
"A" channel (including local site IDU, ODU and remote site IDU, ODU) alarm information. FLS: frame loss.



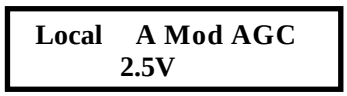
"A" channel C/N.



"A" channel bit error rate



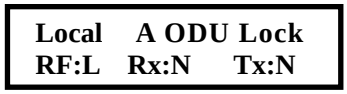
"A" channel E1 rate.



"A" channel AGC level.

"A" channel ODU version, SV: software version, HV: hardware version.

"A" channel ODU serial number.

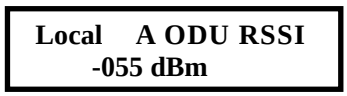


This item shows the ODU local oscillator frequency lock status. **RF** is local oscillator radio frequency, **Tx** is the transmit IF local oscillator frequency, **Rx** is the receive IF local oscillation frequency, "**L**" is lock, "**N**" is un-lock, "**x**" is no information.

This item shows Tx RF which is read from the local "A" channel 15GHz ODU. If the display shows "**xxxxxxxx**", it means there is no frequency information to be read.

This item shows Rx RF, which is reading from the local "A" channel 15GHz ODU. If the display is "xxxxxxxx", it means there is no frequency to be read.

This means the local "A" channel **ODU** Po and power switch status.



This is the "A" channel ODU RSSI level.

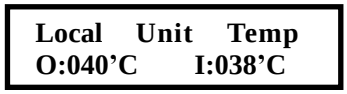
This has two items, left is the ATPC level of the local "A" channel ODU, right is the ATPC switch status. **ON:** ATPC active, **OFF**: ATPC deactivated.

This shows IF filter bandwidth of local "A" channel ODU.

This item displays the local "A" channel ODU internal temperature.

4.1.3.2 Auxiliary parameter settings

- **Device Internal Temperature Display**

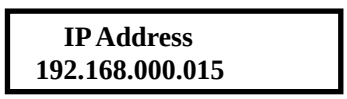


This shows the local ODU and IDU internal temperatures.

- **WEB Operating Right setting**

This menu is the option for allowing web-management. **Enable** option: the user can do web-based modification; **disable** option: the user cannot do web-based modification.

- **IP Address Setting**

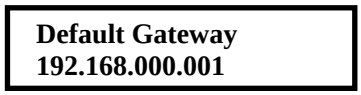


Setup IP address for web access or SNMP management.

- **Subnet Mask Setting**

Setup subnet mask for web access or SNMP management.

- **Default Gateway Setting**



Setup default gateway for web access or SNMP management.

- **Manager Computer Address Setting**

Setup management computer IP address for SNMP management.

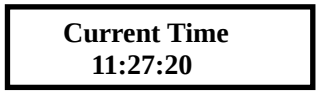
- **MAC Address Setting**

Setup MAC address for web access or SNMP management.

- **Broadcast Address Setting**

Set up broadcast address for web access or SNMP management.

- **Time Setting**



The current time can be modified. When the power is off, the battery inside the IDU will allow the system to continue counting time. The timing is applied for statistics and event records. Event management also can be checked via the IDU-based web interface.

- **Date Setting**

Current Date
2005-07-12

Current date's setup; can be modified and can be used for statistical and event record purposes. If the power is off, the date record will still advance.

4.2 WEB Management

The IDU incorporates an integrated WEB server. The radio's management and control can be operated via web access. After the IP address of radio has been configured, a computer can access the radio via LAN or WAN. By using IE (Internet Explorer) and inputting the IP address in the URL input line of IE, the user can then log into the radio terminal.

4.2.1 WEB Menu

- 【Login】
- 【Main menu】
  - 【operation state】
    - 【general information】
    - 【frequency information】
    - 【power information】
    - 【site address】
    - 【capacity】
    - 【alarm】
    - 【1+1 protection status】
    - 【system time】
    - 【others】
  - 【frequency setting】
    - 【Tx frequency】
    - 【Rx frequency】
  - 【power setting】
    - 【Tx power setting】

- 【Po switch setting】
- 【ATPC monitoring level setting】
- 【ATPC power switch】

【site name setting】

- 【company name setting】
- 【site name】

【capacity setting】

- 【bandwidth setting】

【alarm setting】

- 【BER threshold setting】
- 【Rx threshold setting】

【tributary】

- 【tributary config】

【1+1 config】

- 【working channel selection】
- 【working mode selection】

【system time setting】

- 【equipment time setting】

【test】

- 【loopback】

【network config】

- 【network setting】

【account modify】

- 【user name modify】
- 【user password modify】

【tributary type config】

【event】

【link character management】

【E1/LAN character management】

【link alarm threshold】

【E1 alarm threshold】

4.2.2 WEB Operating Description

- **Input IP Address in Explorer**

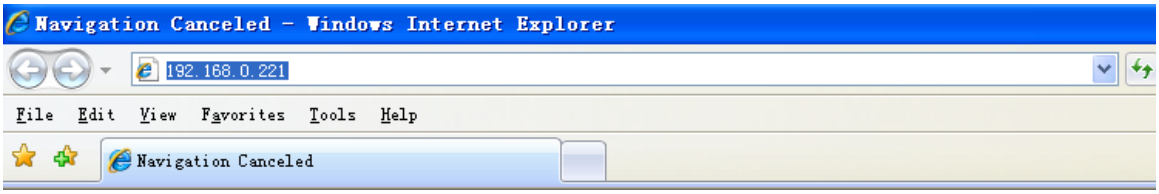


Fig. 17 Input IP Address in WEB Explorer

- **WEB Login**

Fig. 18 WEB Login Page

Enter the User name and password in the login page, click "login" – the user will then pass into the monitor page. There are two users that can operate this WEB page: **ADMIN** and **USER**. The ADMIN can modify parameters of a terminal, and the USER can view parameters of terminal.

Initial passwords: "admin" for **ADMIN** and "public" for **USER**.

After a successful login, the password can be changed. If the user name is ADMIN, the user must sign out thoroughly. If the user forgets to do so, the system will do so after 30 minutes. If the passwords are forgotten, they can be cleared using the LCD panel of the IDU.

- **Run status**

All status information on this page can be found on the web panel indicator or using the LCD; they serve the same purpose except TEST, WORK, PWR.

For this page, letters (or symbols) in green mean normal operation. Letters (or symbols) in red mean some problem. Letters in black means system default or a fixed value.

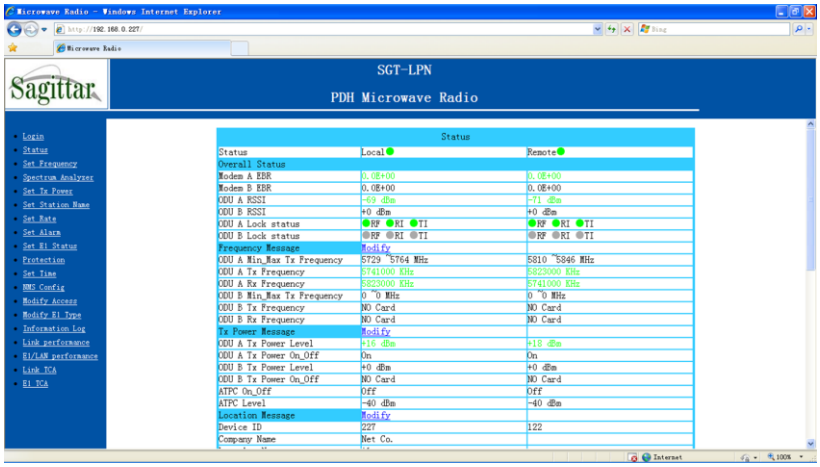


Fig. 19 Run Status

- **Frequency setting**

In the frequency setting options, Rx frequency corresponds with an associated Tx frequency. Therefore, when you change Tx frequency, Rx frequency will change and follow it automatically:

Fig. 20 Frequency Settings

- **Spectrum Analyzer**

In this menu, you can use a spectrum analyzer and view analyzer results. Based on the results, you can choose to set the appropriate frequency.

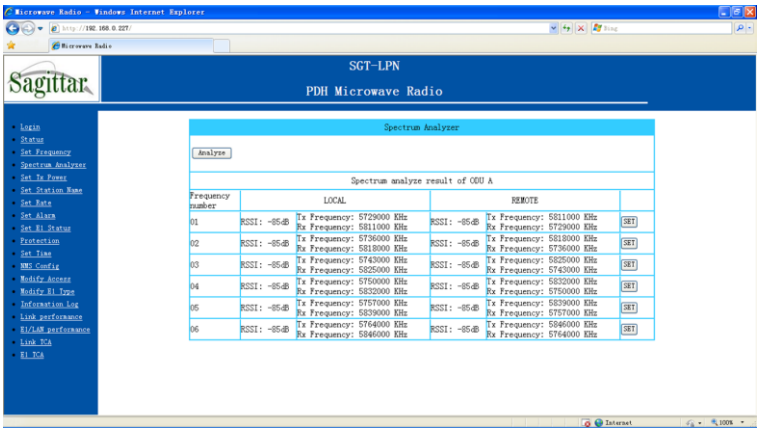


Fig. 21 Spectrum Analyzer

- **Transmit power (RF Po) setting**

In this menu, RFPo output level is set ON. ATPC power level depends on the engineering project (e.g. -60dBm); if required, ATPC is set ON.

Fig. 22 Transmit Power Settings

- **Station configuration**

Station name setting supports 12 letters.

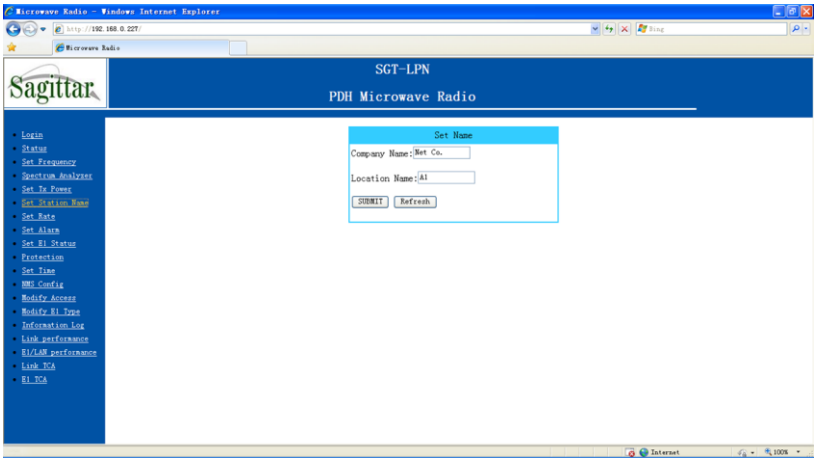


Fig. 23 Station Configuration

- **System capacity setting**

As per the requirement of the purchase order, the setting of service cards can be done using the WEB interface.

Note: for one hop, both sites should have the same configuration.

Fig. 24 System capacity settings

Table 20 System capacity setting

System capacity	Bandwidth (MHz)
2E1	**3.5**
4E1	**7**
8E1	**14**
16E1	**28**
Capacity equal 8E1 10/100BASE-T+2/4E1	**14**
Capacity equal 16E1 10/100BASE-T+2/4E1	**28**

- **Alarm setting**

Alarm threshold option and Rx level threshold alarm option.

Fig. 25 Alarm setting

- **E1 Tributary Setting**

Description :

Tributary status must be matched with its setting status. If tributary status is set to USE, it must be connected; if not, there will be associated alarms.

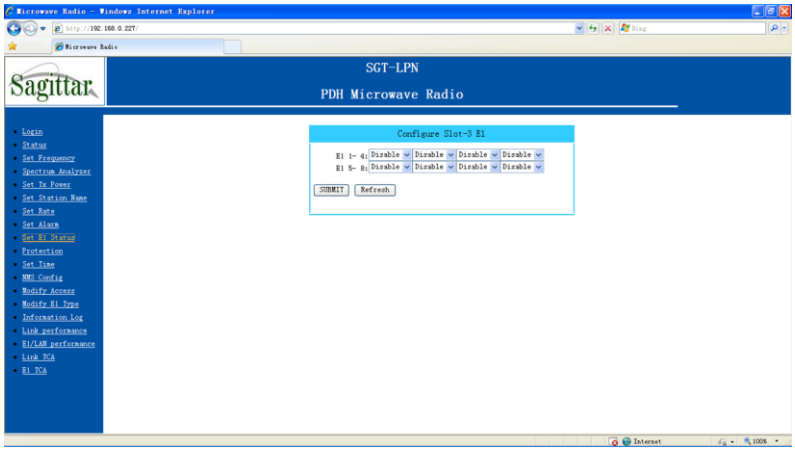


Fig. 26 E1 Tributary Setting

- **1+1 Configuration**

This page is available for of 1+1 configuration:

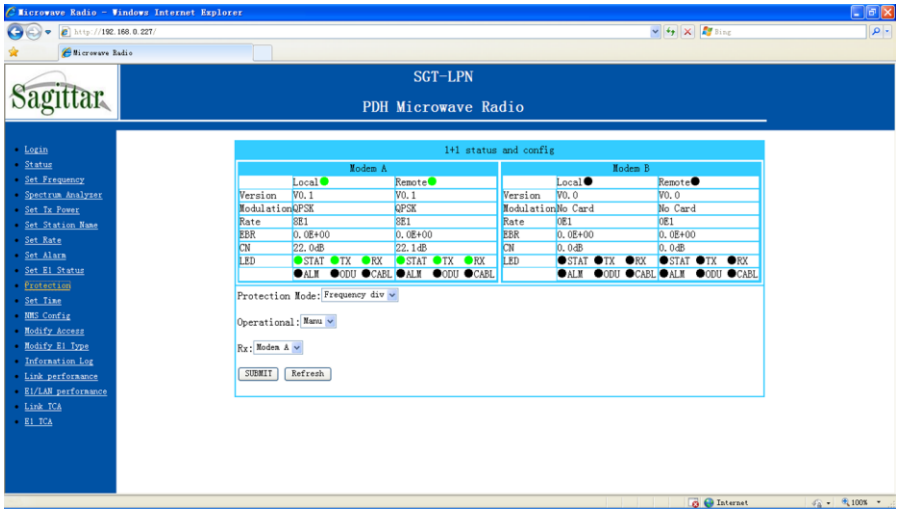


Fig. 27 1+1 configuration

- **System time setting**

System time includes two parts, one is system time of the IDU; the other is the statistics time spacing, which is the spacing time for one record period.

Fig. 28 System time setting

- **Network address setting**

This page configures addresses: IP, network gateway, SNMP Manager, TRAP Manager.

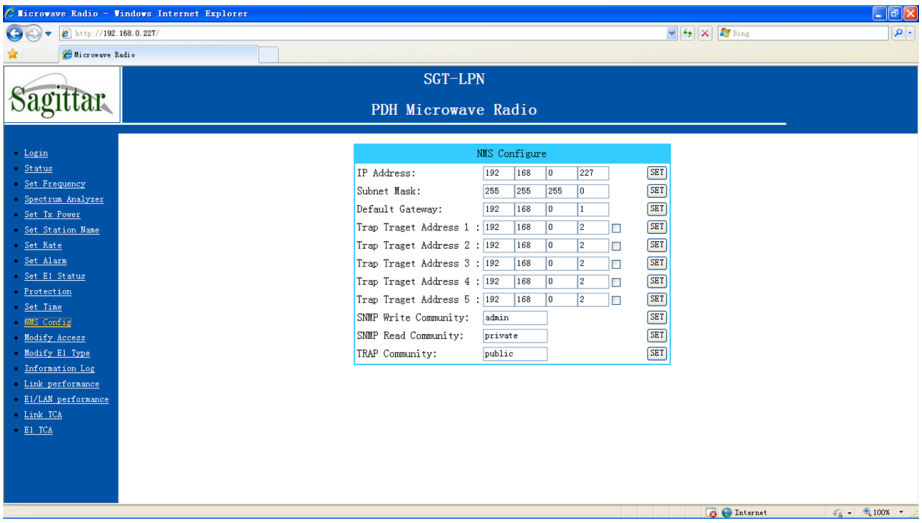


Fig. 29 Network setting

- **Modify Account**

This operation means users can change password by themselves.

Fig. 30 Modify Account

- **Verify type setting**

This page modifies the receive signal method of the service card.

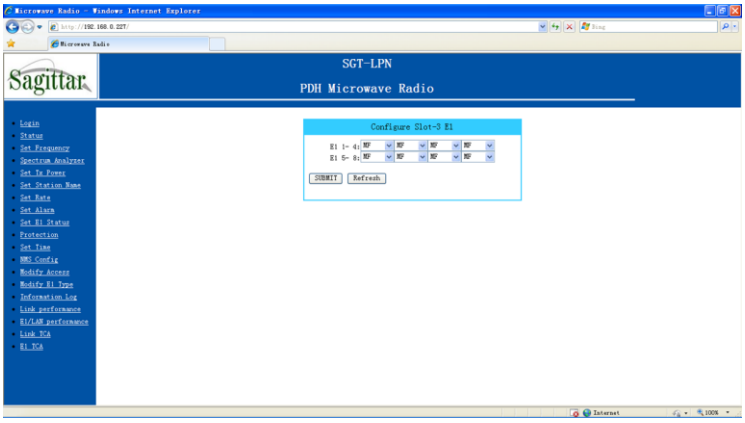


Fig. 31 Verify type (modify)

- **Event record**

This item records the history of modification parameters, operating actions and alarm information.

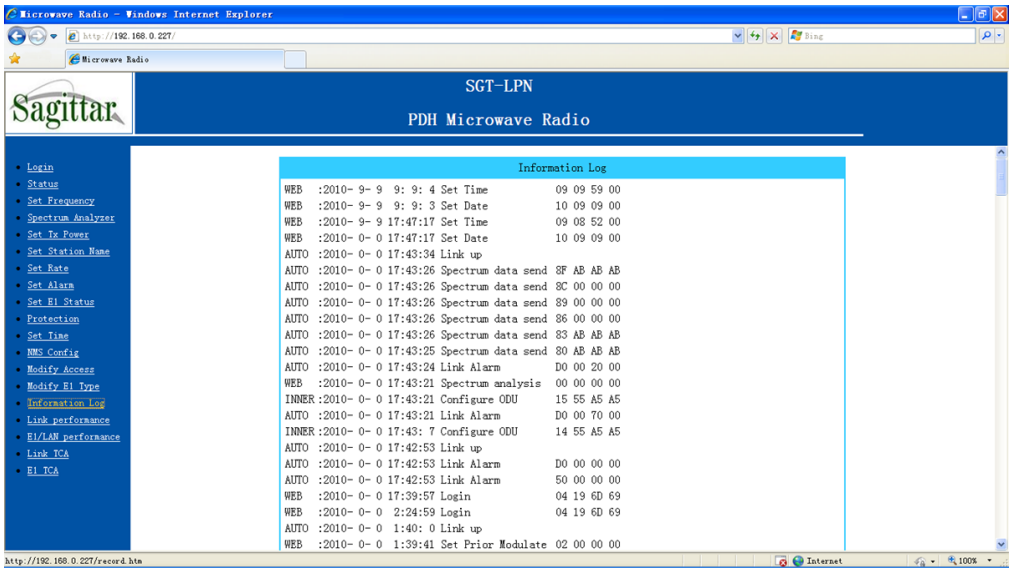


Fig. 32 Event record

- **Link Performance**

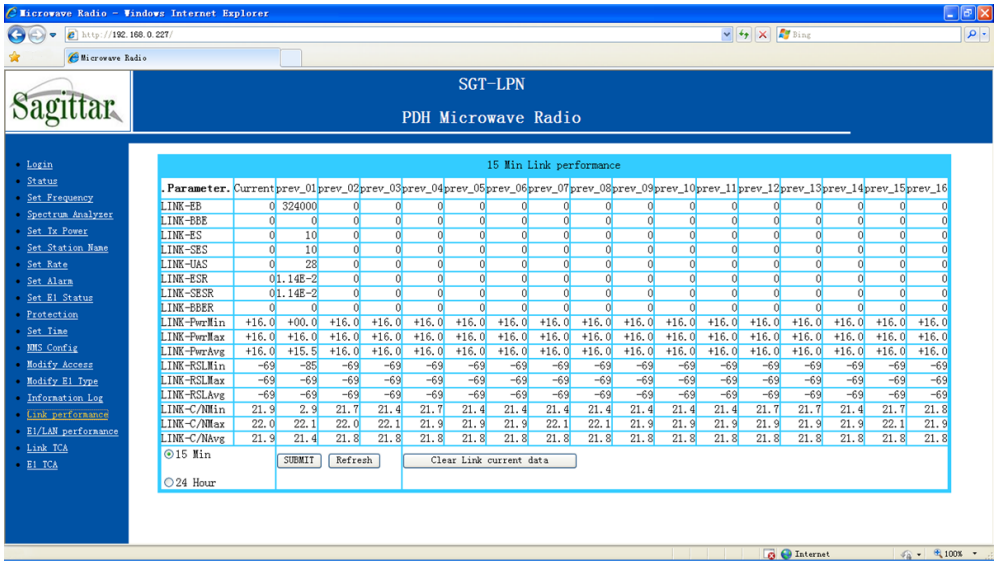


Fig. 33 Link Performance

- **E1 Performance**

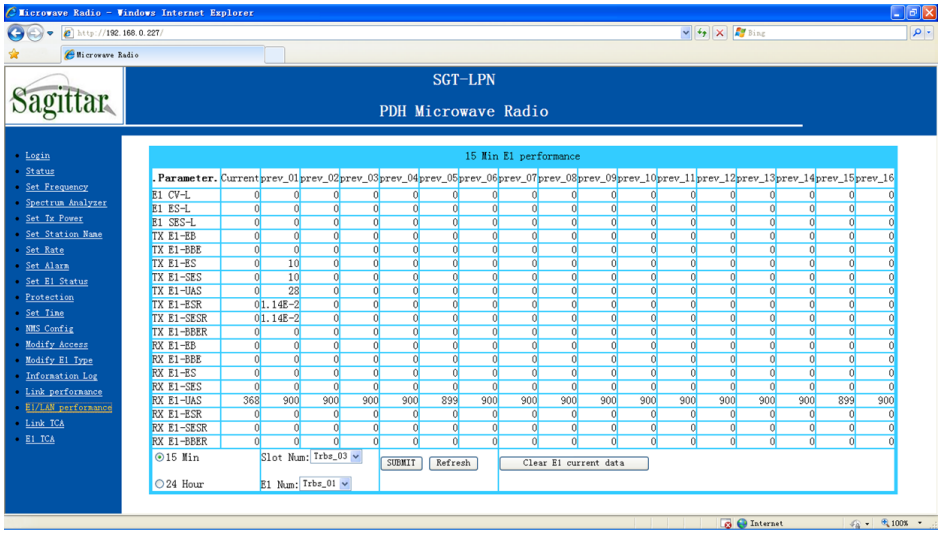

Microwave Radio - Windows Internet Explorer
SGT-LPN
PDH Microwave Radio
Login
Status
Set Frequency
Spectrum Analyzer
Set Tx Power
Set Station Name
Set Rate
Set Alarm
Set E1 Status
Protection
Set Time
NMS Config
Modify Access
Modify E1 Type
Information Log
Link performance
E1/LAN performance
Link TCA
E1 TCA
15 Min E1 performance
.Parameter. Current prev_01 prev_02 prev_03 prev_04 prev_05 prev_06 prev_07 prev_08 prev_09 prev_10 prev_11 prev_12 prev_13 prev_14 prev_15 prev_16
E1 CV-L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
E1 ES-L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
E1 SES-L 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TX E1-EB 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TX E1-BBE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TX E1-ES 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TX E1-SES 0 10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TX E1-UAS 0 28 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TX E1-ESR 0 1.14E-2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TX E1-SESR 0 1.14E-2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
TX E1-BBER 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RX E1-EB 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RX E1-BBE 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RX E1-ES 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RX E1-SES 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RX E1-UAS 368 900 900 900 900 899 900 900 900 900 900 900 900 900 899 900
RX E1-ESR 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RX E1-SESR 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
RX E1-BBER 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
15 Min
24 Hour
Slot Num: Trbs_03
E1 Num: Trbs_01
SUBMIT
Refresh
Clear E1 current data

Fig. 34 E1 Performance

- **Link TCA (Threshold Crossing Alarm Settings)**

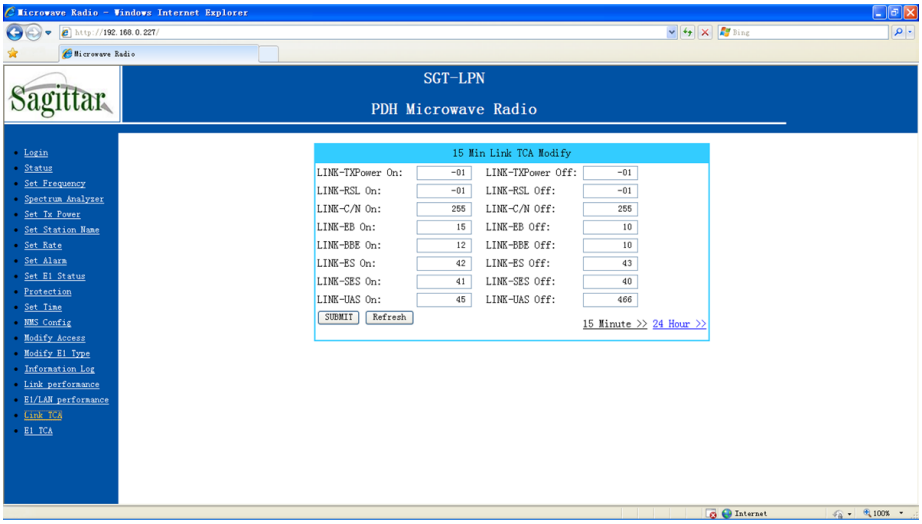


Fig. 35 Link TCA

- **E1 TCA (Threshold Crossing Alarm Settings)**

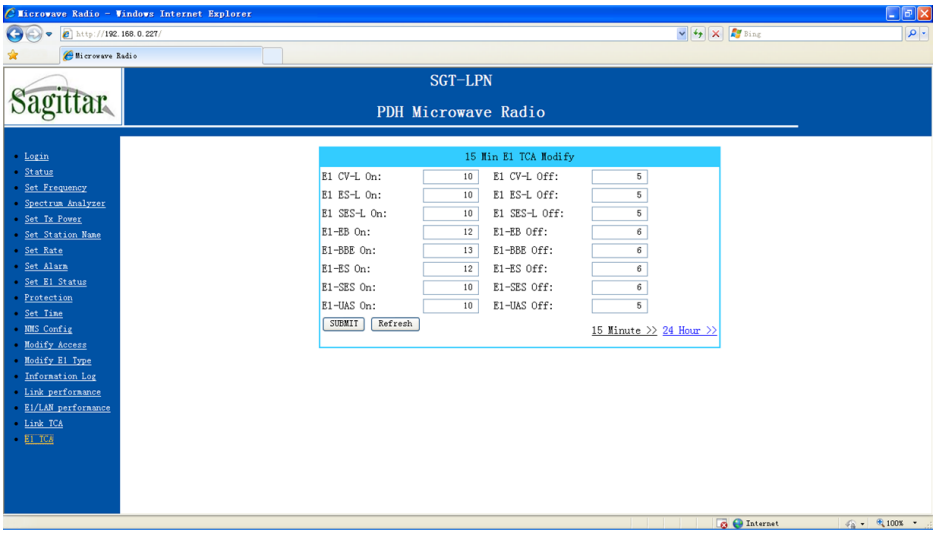


Fig. 36 E1 TCA

5 Network Management System (NMS) —— Option

5.1 Overview

An NMS is used for radio link management i.e. monitors the device's operating status, routes intelligent management information, calculates the performance of a radio link, locates faults and the operation mode. It can provide a lot of available information on devices and form reports for users. The IDU uses the SNMP protocol to provide information the physical layer's performance. All control and monitoring is managed by a computer through an RJ45 jack. NMS supports SNMPC and HP Openview (amongst others). The use of NMS is optional.

- **Radio management stage**

Management is divided into 3 stages:

- Low-level management —— device stage

  Completed by CPU in the IDU, which monitors and controls the device modules including collecting alarms, calculating performance, configuration, safety protection, etc.

- Second stage —— Microwave link stage

  When the radio is working, this stage monitors using a computer connection to the radio; there is collection of information using an "SNMP agent" in the IDU; the agent collects information and sends it to the NMS.

- Third stage —— telecom network management stage

  This stage entails management of the larger-scale telecom network. There is a NMS center which manages more than two SNMP agents (within IDU's); thereby allowing complete management of the entire network. The SGT-LPN radio can be linked to the Internet. NMS includes SNMP, G.821 and can monitor every device using LAN or WAN.

- **Network topology**

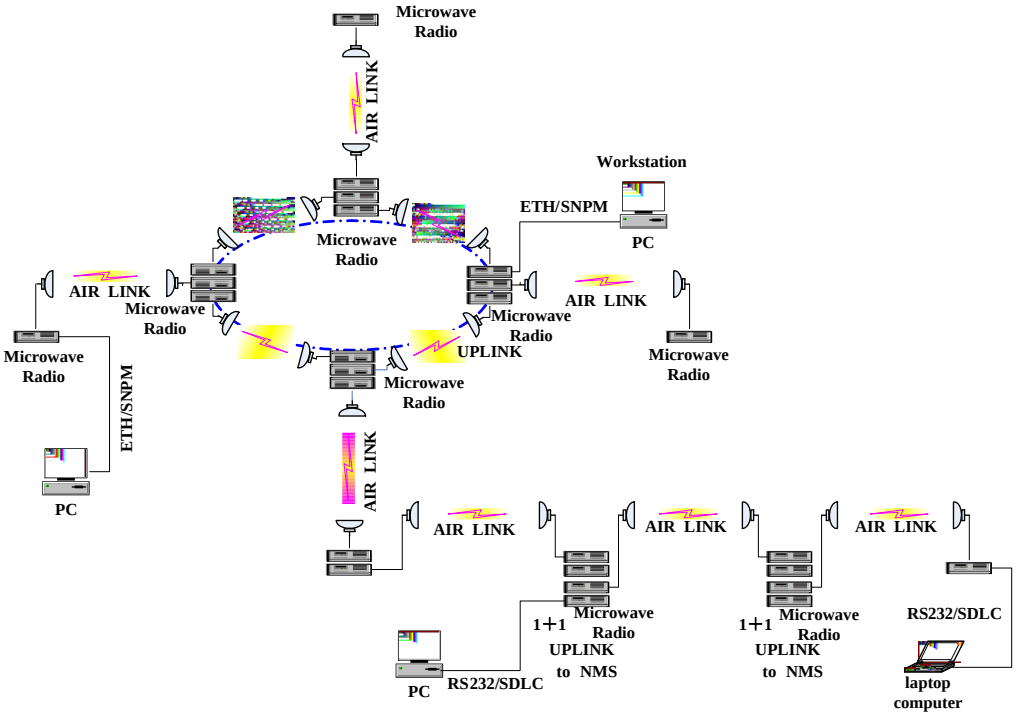


Fig. 37 Microwave transmission network topology

5.2 NMS

The NMS can provide centralized-control of radios. The IDU has two ports that can be linked to a monitoring computer. One is an Ethernet port, the other is an RS232 port. The RS232 port doesn't support remote control. The network management system interface is an Ethernet port. These ports support:

- Ethernet, TCP/IP, SNMP, HTTP
- RS232 telnet

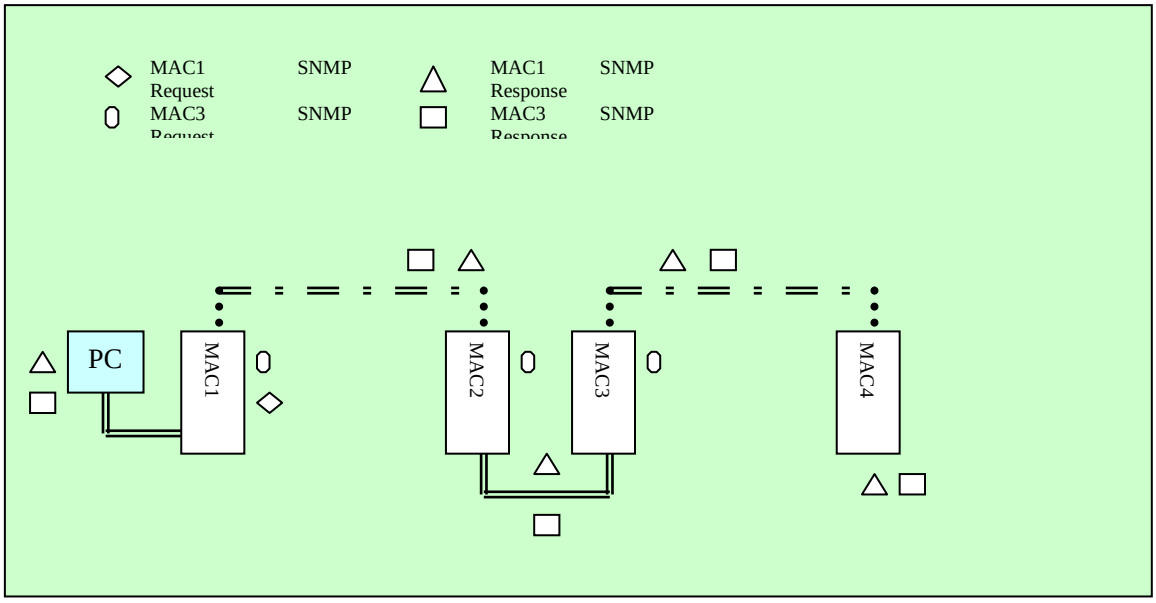


Fig. 38 SNMP data in microwave links

5.3 NMS IP configuration

- **IP address setting**

Generally, for small size network, C class IP addresses are used for IP address. e.g. 210.140.73.2 or 192.168.1.33

- **Subnet mask setting**

The Subnet mask is a 32 bit mask assignment, which is mainly used to define the network number, host number of IP address and divide one large IP network into several subnets e.g.255.255.250.0

- **Gateway setting**

The "Gateway" is an IP address from one network to another network.

- **Management address**

This address is the NMS's IP address.

- **MAC address**

MAC (Media Access Control) layer address is also called the physical address/hardware address/link address; it is set at the factory and cannot be changed.

- **Broadcast MAC Address:**

This address is the MAC address of the querying computer. When the IDU doesn't find the target IP MAC, determining the MAC of the target IP by means of transmitting an ARP request, includes using the "Broadcast MAC address". Generally, the broadcast MAC is "FFFFFFFFFFFF". These addresses are only setup from the IDU panel, not using the WEB interface.

5.4 NMS Operating Description

The NMS solution manages radios by using three SNMP functions:

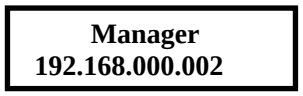
- radio configuration
- status query
- TRAP: By monitoring a radio's status, as soon as a radio has an alarm, the terminal immediately reports a TRAP alarm to the management computer.

The NMS consists of two parts:

- Embedded SNMP Agent (program function inside IDU)
- Management (usually connects to a management computer)

The Agent part is embedded in the IDU software; no additional settings are needed – the Agent does not need more settings in order to query the link (it performs these functions automatically).

TRAP function



This menu should be filled in with the IP address of the SNMP Manager. The SNMP Agent will deliver a TRAP to this IP address.

Management software application:

After installing SNMPC on a computer, then follow the steps, described below:

First step: Add MIB file

Copy SNMPc.exe to root direction then run it. At the pull down menu config select MIB database, then select Add. In the pop-up dialog box select Sagittar.mib, then select OK. Compile MIB file to database.

Second step: Build a node

Select menu insert device to build a new device as follows:

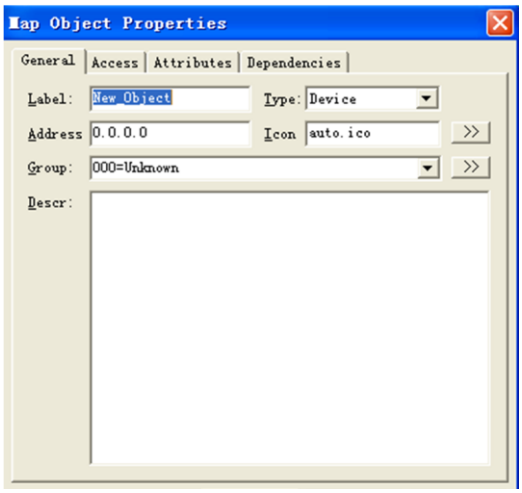


Fig. 39 Build a device

In the Label menu, fill in the device name. In Address menu, fill in the IP address (e.g. 192.168.1.25).

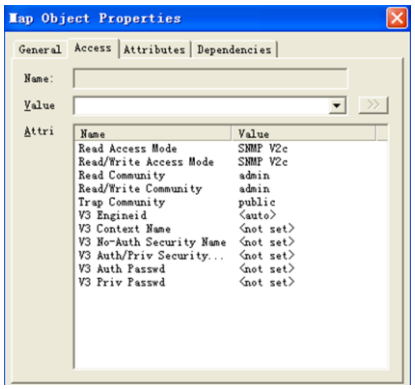


Fig. 40 Setting device properties

Modify the parameters of first four items as above.

After all of the above steps, double clicking the node will show as follows:

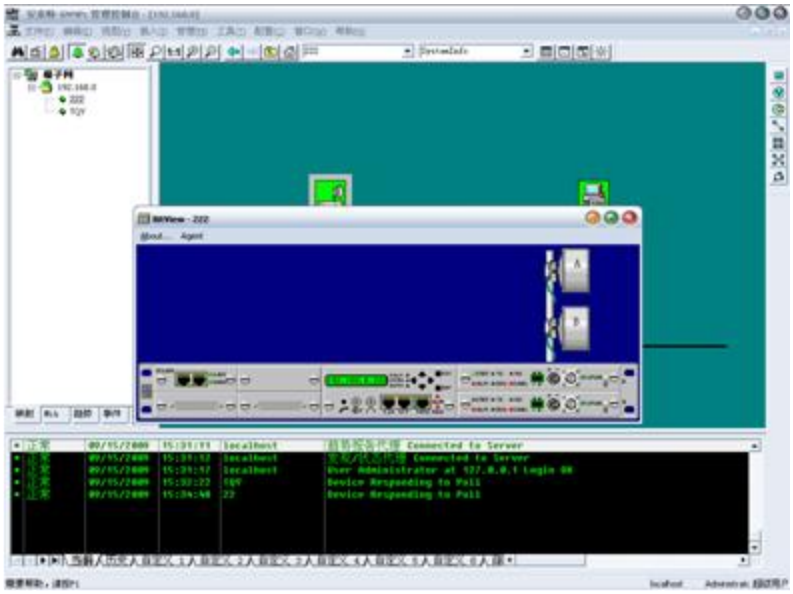


Fig. 41 SNMPC Management Interface 1

The user can view status of the radio not only in the GUI, but also in the Agent menu.

Fig. 42 SNMPC Management Interface 2

In figure 42, click Info menu. The menu will show the status of radio; click config can be used to set the configuration of devices. In menu Tribs_Relay, a user can view the status of each tributary and corresponding loopback options.

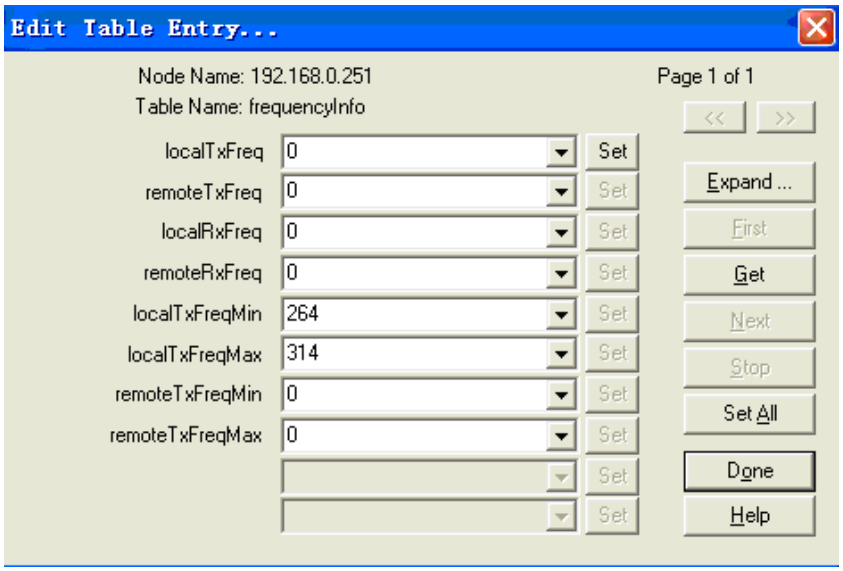


Fig. 43 SNMPC Setup

6. Project Installation

6.1 Preparation Before Installation

This Section assumes that pre-planning of the link has been completed; i.e. path budgeting and survey to ensure good line-of-sight between the two stations and cable length estimations.

Installation tasks are listed below:

- Equipment and Tools Required
- Equipment Inventory
- Antenna Installation
- ODU Installation
- Cable Installation
- IDU Installation

6.1.1 Microwave Site Conditions

- The installation room should be completed and dry.
- The cable-trays (line-slot or line-through-slot), illumination, AC power, DC power (-48V ±10%, ripple≤100mV) should be ready.
- Air-conditioning establishment should be ready. Temperature and humidity should be in accordance with the installation conditions.
- Earthing of the building should be in accordance with lightning protection requirements.

6.1.2 Preparation Before Antenna Installation

- The tower or building should be strong enough to withstand 56m/s wind velocities; grounding should be in accordance with lightning protection requirements.
- Antenna pole adapter: seamless steel pipe with diameter ϕ80～ϕ110mm and length 1.5m to 2m.
- Fasten the pole to the tower.

6.1.3 Technical Preparation Before Installation

- Read the User Manual and follow the instructions for installation and operation.
- Check the equipment packing list and make sure all equipment is in the boxes.
- Record the serial number, frequency and site type (high or low station).
- Installation and maintenance must be performed by professional personnel or done under supervision by professional personnel.

6.1.3 Required Installation Equipment

Tools

Table 21 Installation Tools

No	Name	Size
1	Cross screw driver	4×150mm
		1.5×70mm
2	Straight screw driver	4×150mm
		1.5×70mm
3	Adjustable Spanner (wrench)	300mm
		150mm
4	Spanner	13-15mm
		14-17mm
		17-19mm
5	Sharp nose pliers	
6	Wire-cutter	
7	Electrician’s knife	
8	Scissor	
9	35W soldering iron (tip head)	
10	Multi-meter	10A

Equipment

Assuming that the installation personnel have the necessary radio equipment and antenna, the only other items needed are:

- RG-8/U cable of suitable length.
- At least two N-type connectors suitable for termination of the RG-8/U cable.
- To ground the IDU, a suitable length of 2.5mm^2 ground wire minimum is required. Attach wire to the IDU ground post (4 mm / 0.064 in. diameter).
- For power supply to the IDU, suitable lengths of power supply wire are required. It is recommended to use red for the +Ve power connection and black for the -Ve power connection.
- Enough cable-ties to fasten all cables.

6.1.4 Equipment Inventory Check

Verify the item list of SGT-LPN radio components before beginning the installation. Ensure the part descriptions detailed in the tables below correspond to the components required for the installation; i.e. correct ODU frequency band, T-R spacing, capacity, service interface and IDU configuration. The radio configuration is determined by the Customer Specific Data Sheet, which has been agreed upon by the customer.

The basic components of the device box are listed in Table 22:

Table 22 Device Box

Item	Quantity	Components	Description
1	2	IDU Box	IDU device
2	2	ODU box	ODU device
3	2	Installation kit	
4	1	Manual CD	SGT-LPN Installation and Operation Manual

Table 23 Installation kit

Item	Quantity	Components	Description
1	1	Mount IDU screws	Including M6×16mm exterior hexagon screw, spring washer, identity, nut: four apiece. OT2.5-4, OT2.5-6
2	1	DB37-TP E1 data cable	5m cable for E1 data connection, one end is RJ-48C, one end is DB37

3	10m	Power supply wire	ZR-RVV2×1 mm^2
4	1.2m	ODU Ground wire	16 mm^2 BVR copper-cored wire
5	5m	IDU ground wire	2.5 mm^2 BVR copper-cored wire
6	1	RF Cable	ODU-5.8G RF cable with N-type connector 1.5m (NO RF cable for other frequency radio)
7	1	Power supply plug	Power supply plug
8	1	TNC-N Coaxial Cable plus 2*N connectors	A 3m SYV-50-5 Coaxial Cable, with N type and TNC type connectors, plus 2*N-type connectors for IF cable
9	1	ODU Grounding terminals	Including M8×16mm exterior hexagon screw, spring washer
10	1	Earthing/ ground copper plate (1+0)	An "N-to-N connection assembly" passes through a "copper plate" that can be earthed. The assembly interconnects a TNC/N IF cable (running from the IDU to the copper plate) to an N to N IF coaxial cable which runs as the major length up to the N-type connector of the ODU
11	50	Cable Tie (long)	Black, Anti-UV
12	50	Cable Tie (short)	Black, Anti-UV
13	1	Isolation tape	
14	1	Waterproof adhesive	

6.2 Antenna installation

This chapter covers the antenna installation procedures that need to be implemented at each side of the link. Antenna installation consists of the following steps, which should be performed in the order listed below:

- Pre-Installation Procedures
- Mounting the Antenna Positioner to the Pole
- Mounting the Antenna to the Antenna Positioner
- Visually Aligning the Antenna Positioner

6.2.1 Pre-Installation Procedures

The SAGITTAR subsystems are supplied in three separate cartons as follows:

- One carton contains the IDU(s), its cables and its accessories.
- One carton containing the ODU(s).
- One or more box(s) containing the antenna(s) and its (their) positioner(s), (this includes the antenna positioner and any additional mounting accessories as supplied by the vendor).

Before heading out to the site:

1. Make sure that you have the following tools (not supplied by Sagittar):
   - 11-mm (7/16-inch) open-end spanner/wrench
   - 14-mm (9/16-inch) open-end spanner/wrench
   - 19-mm (3/4-inch) open-end spanner/wrench
   - Allen key set
   - Screwdriver
2. Select the carton(s) containing the Antenna(s).
3. Visually inspect the carton(s) for any sign of visible damage or defects. If a carton is at all damaged, then take a good look at its contents to see that they were not damaged. In any case, we recommend that you notify the supplier about the damaged carton(s).
4. Set the carton(s) on a dry, clean, level surface with the carton(s) facing up (see appropriate markings).
5. Open the carton(s) using the knife and remove the packaging materials.
6. Carefully remove the carton(s)' contents and set them on a flat, clean surface.
7. Check the carton(s)' contents against the packing list.

6.2.2 Mounting the Antenna Positioner to the Pole

The antenna positioner is designed to attach the antenna (and its matching ODU) to a vertical pole (diameter of 48 mm to 115 mm (1.9" to 4.5")). Most antenna positioners allow you to adjust the elevation and the azimuth within the following ranges

Elevation Range:

For 0.3 m antennas: ±50° (±22° for fine adjustments)

For 0.6 m antennas: ±37° (±14° for fine adjustments)

Azimuth Range: ±180° (±15° for fine adjustments)

Mount the antenna positioner on the pole using the instructions and hardware provided by the antenna manufacturer.

6.2.3 Mounting the Antenna to the Antenna Positioner

Follow the antenna manufacturer's instructions in order to attach the antenna to the antenna positioner.

Visually align the antenna positioner as per the manufacturer's instructions. Figure 44 shows an example of antenna azimuth and elevation adjustments (by rotating the Azimuth and Elevation Adjustment bolts).

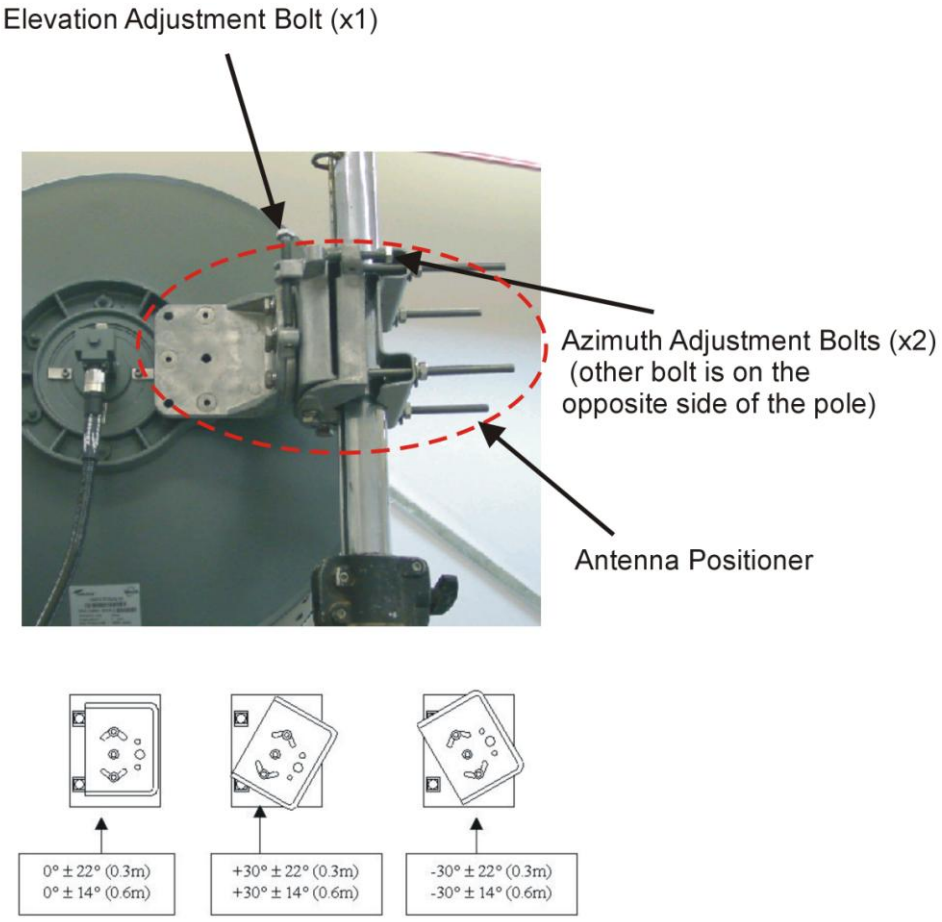

Elevation Adjustment Bolt (x1)
Azimuth Adjustment Bolts (x2)
(other bolt is on the
opposite side of the pole)
Antenna Positioner
0° ± 22° (0.3m)
0° ± 14° (0.6m)
+30° ± 22° (0.3m)
+30° ± 14° (0.6m)
-30° ± 22° (0.3m)
-30° ± 14° (0.6m)

Figure 44. Antenna Positioner Alignment (example)

6.3 Outdoor equipment installation

ODU installation consists of the following steps, which should be performed in thorder listed below:

- Preparing for ODU installation
- Mounting the ODU
- Grounding the ODU and installing optional auxiliary surge suppression devices
- Connecting the IF Cable to the ODU

There are several possible ODU installation configurations, depending on the following parameters:

The ODU frequency (ODUs come in two different models):

- Low Frequency ODU: This ODU covers frequencies up to 5.8 GHz, and is connected to the antenna via an N-type interface.
- High Frequency ODU: This ODU covers frequencies above 5.8 GHz, and the ODU is mounted directly to the antenna.

The SAGITTAR system configuration (that is, Unprotected or Protected):

In an Unprotected system configuration, a single ODU is connected to a single antenna.

In a Protected system configuration there are two possible options:

1. Two ODUs connected to two antennas
2. Two ODUs connected to a single antenna

The ODU–Antenna mounting configuration (that is, Direct Mount or Indirect Mount):

- In a Direct mount configuration, the ODU is directly attached to the antenna. This mounting configuration is only done using a High Frequency ODU
- In an Indirect mount configuration, the ODU is physically mounted to the pole, and then connected to the antenna via RF low-loss cable. This mounting configuration is only done using a Low Frequency ODU.

6.3.1 IF cable installation

- **Making IF cable**:

The length of coaxial cable connector core and IF cable core must be in accordance with requirements. Make-off the end of the IF cable, then tightly connect a coaxial connector and IF cable. The shield layer of IF cable must be tightly inserted into the grounding part of the connector. Then check it to verify there is no short-circuit or open-circuit.

- **Outdoor cable**:
  - The cable length must be made according to the overall requirement (there must be no add-in cabling). It is advised that the cable must be tied every 1m. If needed, leave some extra cable for extension in the future (the installation must adhere to the requisite engineering standards).
  - IF cable and power supply cable must be isolated.
  - Cable in the slot-way (cable tray) must be aligned in an orderly manner, with no excess slack and no crossovers.
  - U-type water path: the outdoor feeder cable must be set a U-shape for water flow, to avoid water flowing into the IDU.
  - Connect the Outdoor IF cable to the connector on the grounding (entry panel) plate.
- **Water ingress protection process for the outdoor unit cable connector**

The connector of the ODU and cable must be sealed using three layer waterproof isolating tape.

- **Indoor IF jumper cable:**

The Indoor cable should pass along the cable tray slot and be tied every 1m. One cable end connects to the IDU using a TNC connector and other end to the connector on the grounding (entry panel) plate.

- **Notice: IF cable setup must be done without the power being on because the DC supply of the ODU passes through the IF cable to the IDU.**

6.3.2 Unprotected System 1+0 Outdoor Equipment Installation

This section describes how to mount the ODU in an unprotected system. This section describes the following configurations:

- Mounting the Low Frequency ODU
- Mounting the High Frequency ODU

6.3.2.1 Mounting the Low Frequency ODU in an Unprotected System

This configuration consists of one ODU and one antenna that are individually mounted to a pole. The ODU and the antenna are then connected via a RF low-loss cable. Figure 45 shows a detailed breakdown drawing of the different parts used in the mechanical assembly (mounting) of the ODU to the pole. Figure 46 shows the final assembly of the ODU after it is mounted to the pole. Figure 47 shows a top view of the ODU–Pole final assembly. The part numbers in these figures are detailed in Table 14.

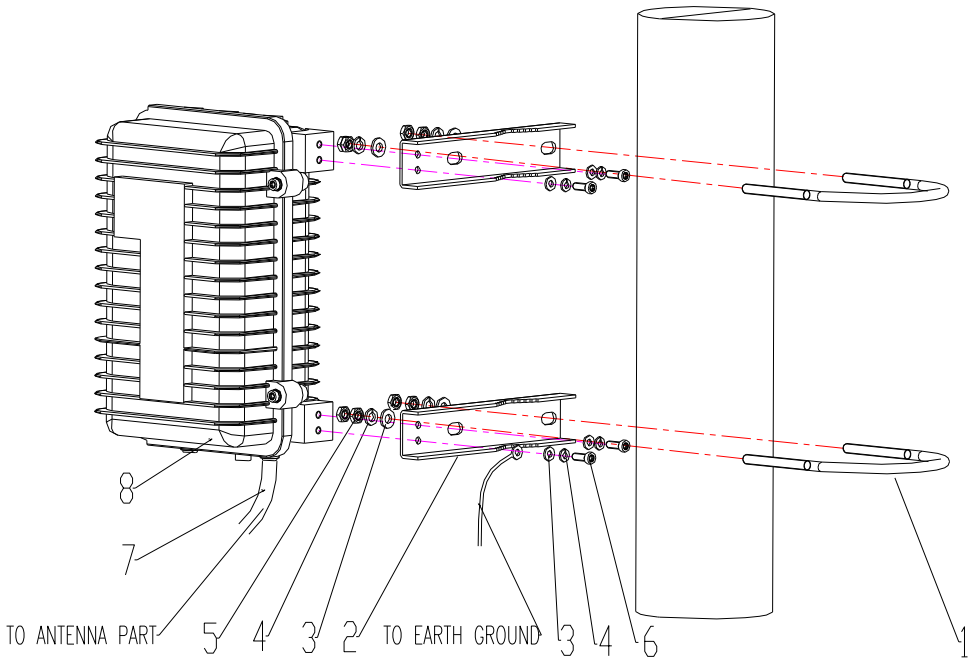


Figure 45A 2.4G/5.8G ODU Pole Mount Installation Breakdown Diagram

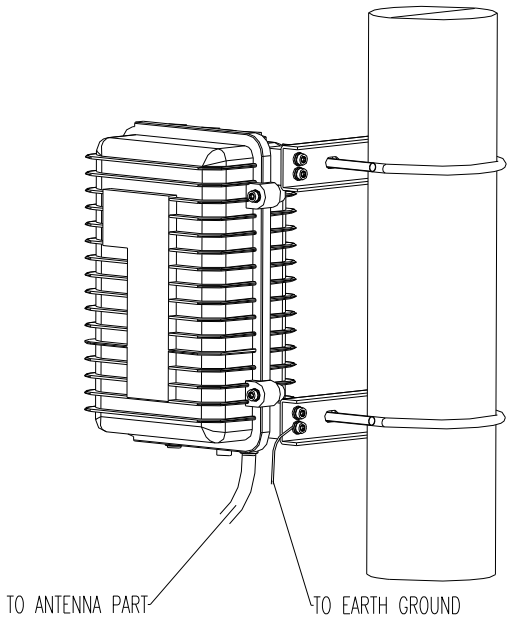


Figure 45B Under 6GHz ODU Pole Mount Final Assembly Diagram

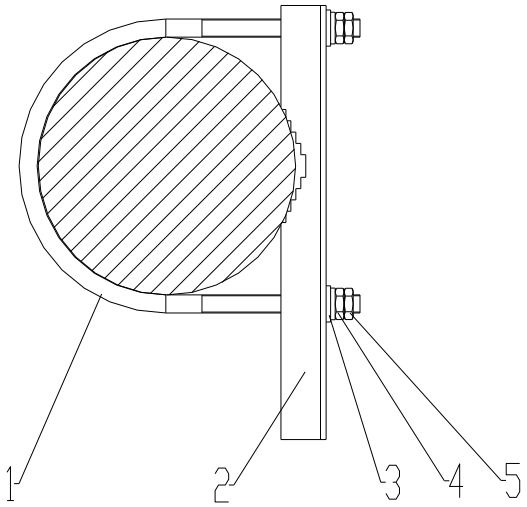


Figure 45C. ODU Pole Mount Final Assembly Diagram (Top View)

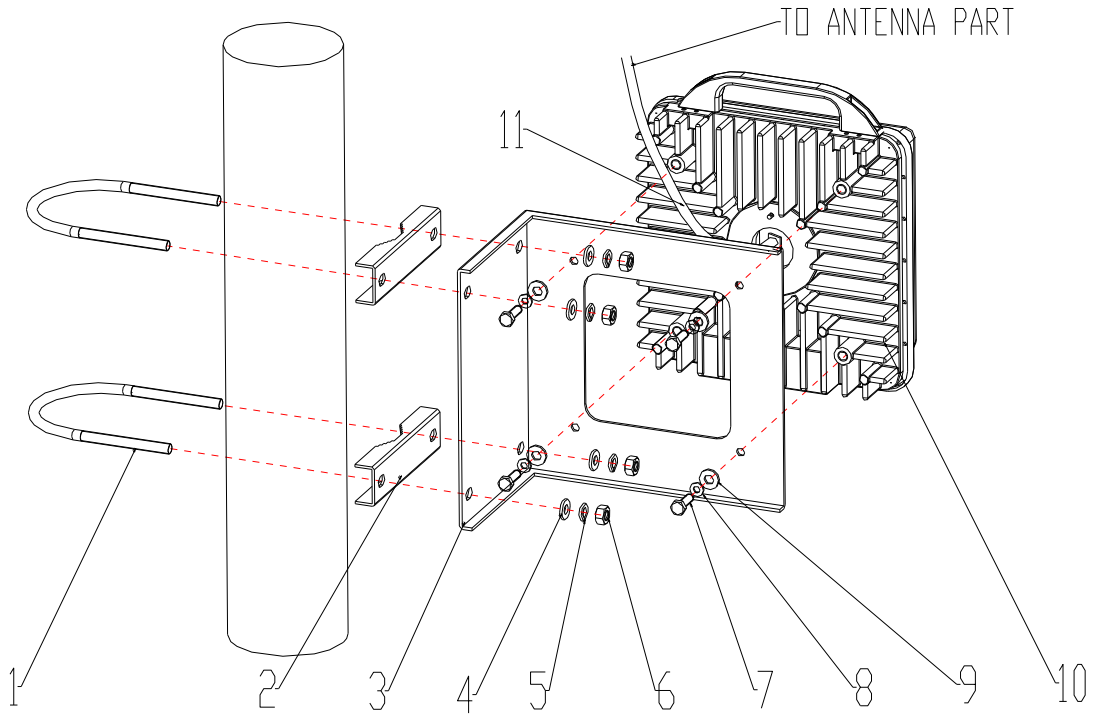


Figure 46A ODU Pole Mount Installation Breakdown Diagram

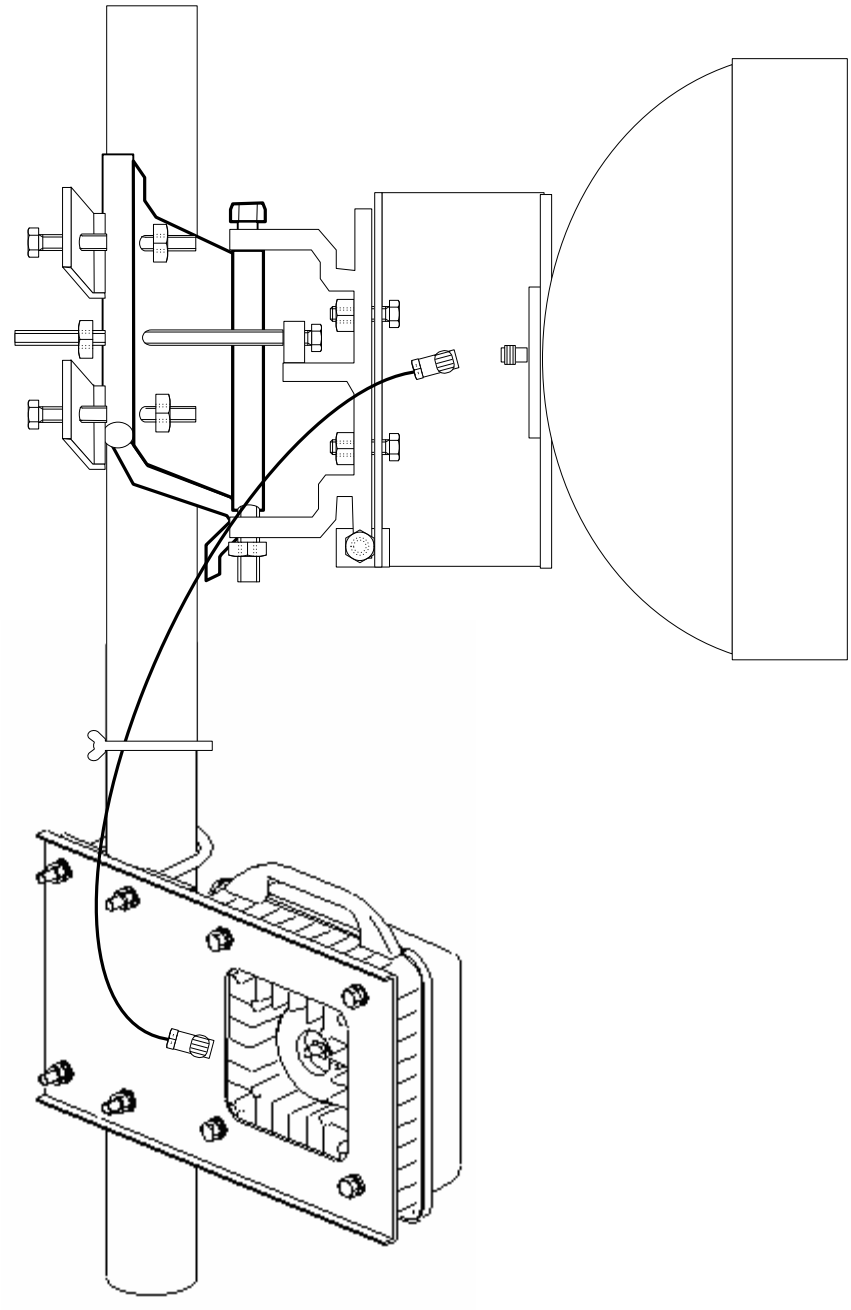


Figure 46B.ODU Pole Mount Final Assembly Diagram

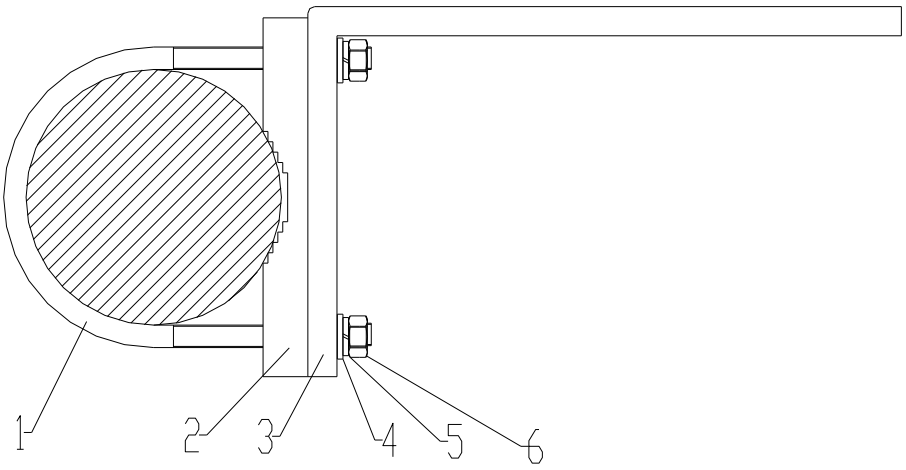


Figure 47. ODU Pole Mount Final Assembly Diagram (Top View)

Table 24 One ODU Connected to One Antenna (LF), Parts List

Part Name	Description	Quantity	Notes
Antenna	Antenna with a coaxial interface (N-type jack connector)	1	Frequency band as per the specified ODUs frequency (Refer to parts list)
RF Low-loss cable	Low loss RF cable, 1m, N-type connectors	1	Refer to parts list
ODU	ODU for low frequency, N-Type connection	1	Low frequency: Up to 11GHz

Installation Procedure

This configuration is assembled as follows:

8. Mount the antenna-mount bracket to the antenna.
9. Mount the antenna on the pole.
10. Mount the ODU on the pole.
11. Connect the RF low-loss cable between the ODU and the antenna.

6.3.2.2 Mounting the Low Frequency ODU in an Unprotected System

The antenna apparatus (Antenna Mount Bracket and Antenna) shown in Figure 48 is mounted to a pole. The ODU is then connected/mounted to the antenna.

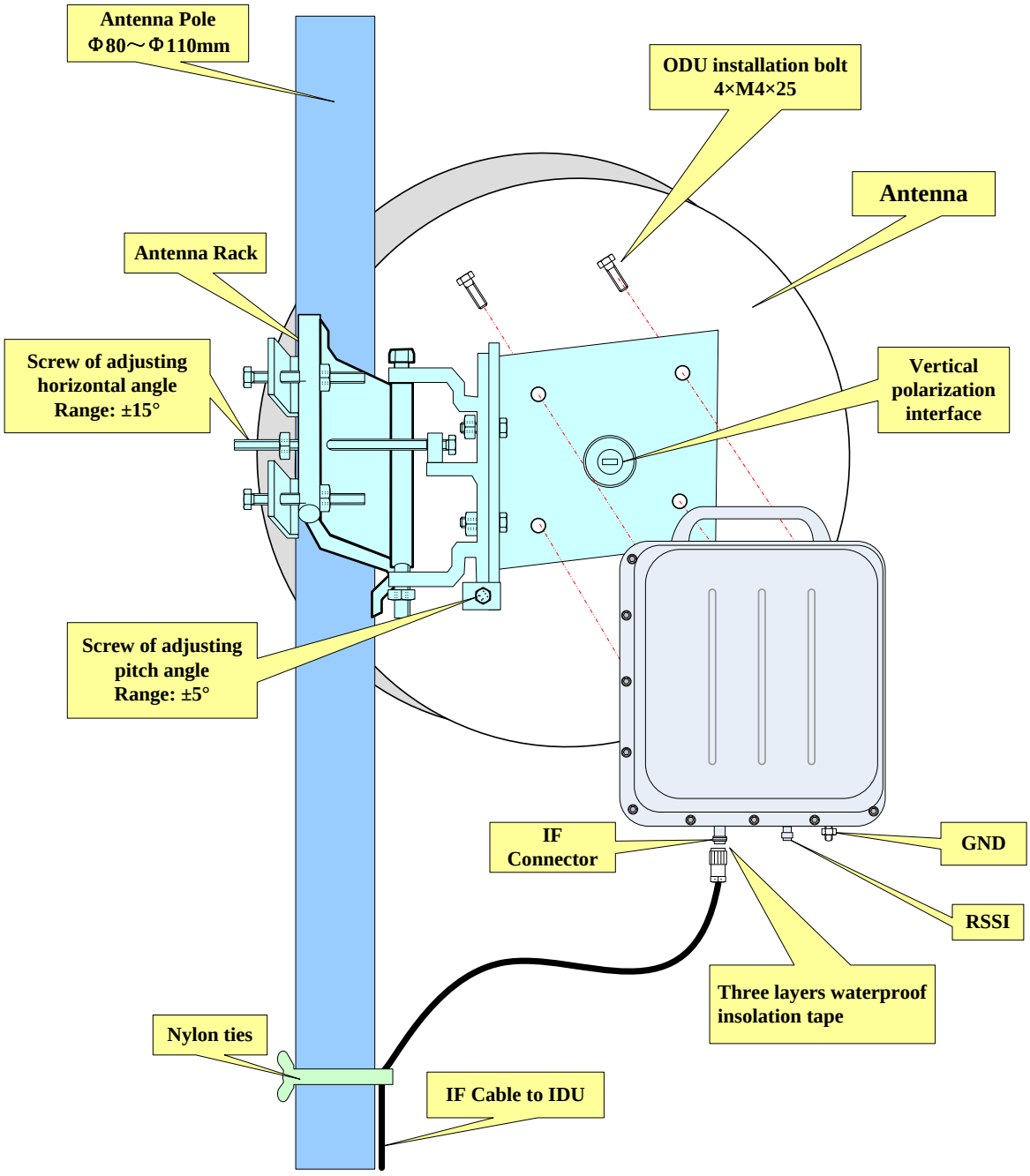


Fig.48 1+0 Outdoor Installation (ODU and Antenna directly connected)

Fig. 449 1+0 Outdoor Installation (ODU and Antenna directly connected)

Table 25 shows the parts required to implement this configuration.

Table 25 ODU–Antenna Direct Mount (HF), Parts List

Part Name	Description	Quantity	Notes
Antenna	Custom Antenna for Direct mount (Refer to parts list)	1	Frequency band as per the specified ODUs frequency range.
ODU	ODU	1	High frequency band

This configuration is assembled as follows:

1. Mount the antenna mount bracket to the antenna.
2. Mount the antenna to the pole.
3. Mount the ODU directly onto the antenna.

6.3.3 Protected System 1+1 Outdoor Equipment Installation

- **1+1 Space diversity mode:**

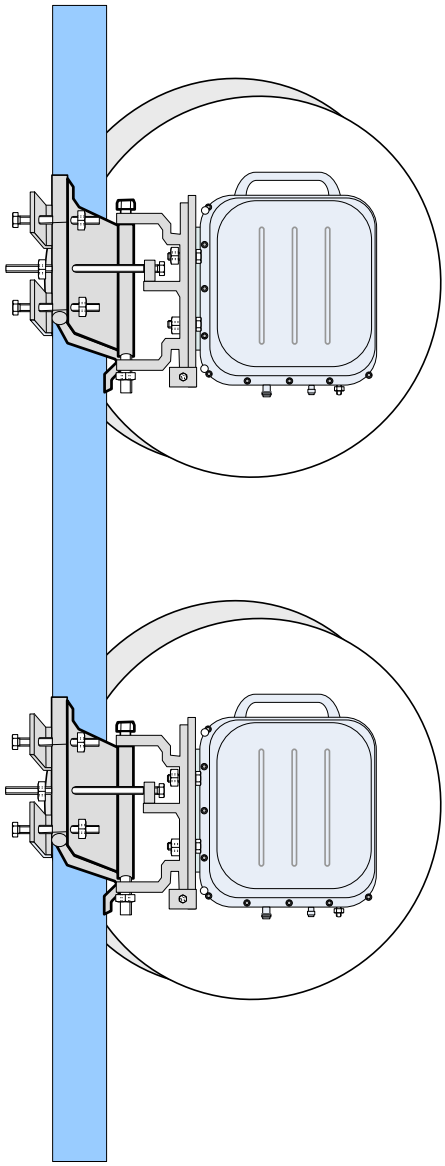


Fig. 50 1+1 Outdoor installation (space diversity mode)

- **1+1 Combiner mode:**

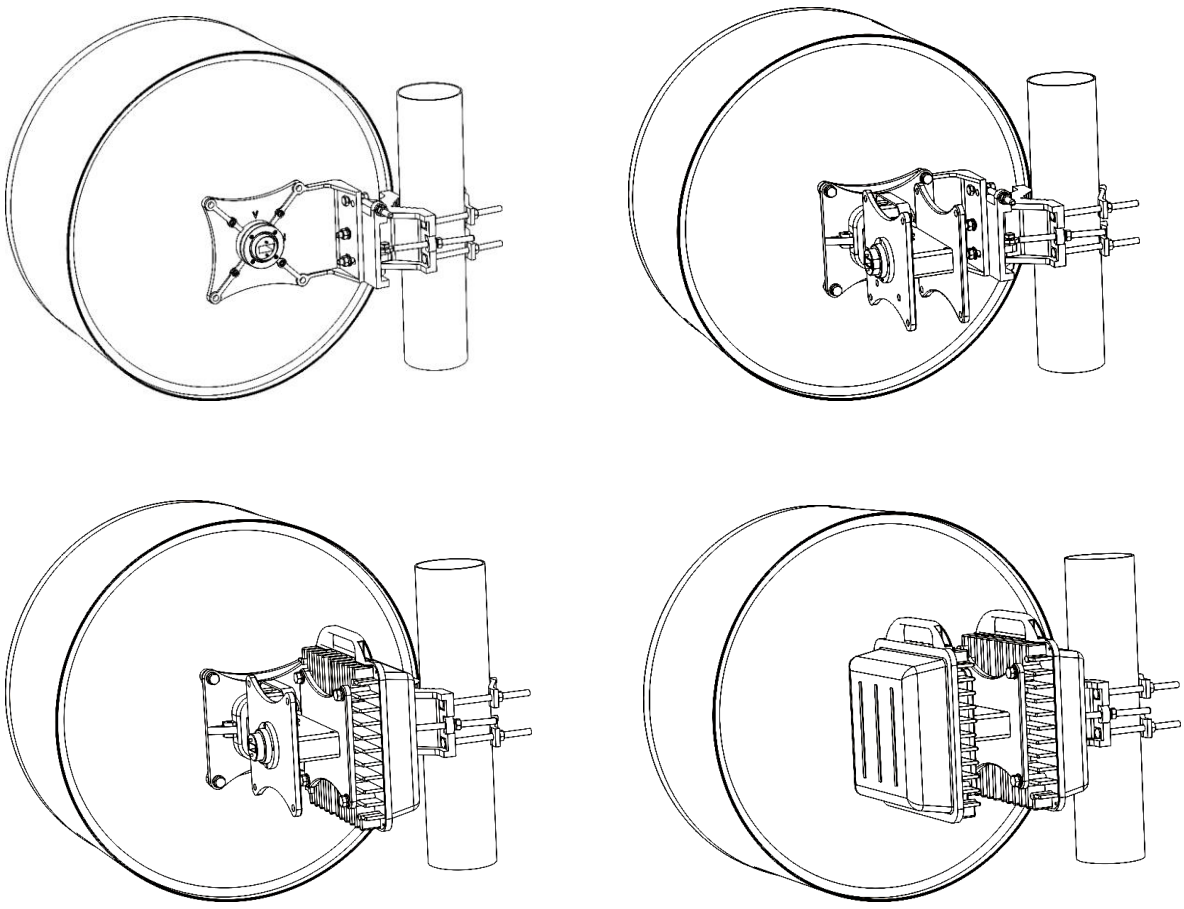


Fig.51 1+1 Outdoor Installation (combiner mode)

6.4 IDU Installation

6.4.1 Installation Procedure

- Position IDU in a standard 19" (19 inch) rack.
- Connect the grounding cable of the IDU to the nearest ground point.
- Connect the IDU and Grounding (Entry Panel) plate using the Indoor "jumper cable".
- Install the service data cable.
- IF required, connect the auxiliary service data cable with the RG-45 connector to the RJ-45 interface.
- Connect the EOW (RJ-11) to the EOW interface.
- The SGT-LPN requires DC power (-48V±10%) via a 2-wire cable (the suggestion is 1.5mm^2 wire).

6.4.2 Grounding the IDU

The SAGITTAR IDU includes a front panel ground terminal in order to connect the IDU to the site ground. The IDU should be properly grounded before connecting the power supply. The IDU ground terminal must be electrically connected to the site earth ground using a 2.5mm^2 copper wire.

Notice : When connecting the power supply to the IDU, DC power and IDU power switch must be off. When everything is ready, then turn on the power.

6.5 Adjust the Antenna Orientation

6.5.1 Antenna orientation adjustment procedure and methods

- When installation is finished, check the DC power supply and then turn on power to the IDU.

- Set the operating frequency, capacity and Po of the two terminals. Then make sure that self-diagnosis works.
- If the self- diagnosis is normal, then adjust the antenna orientation.
- Monitor the ODU RSSI voltage with a multimeter when doing antenna adjustment based on azimuth and elevation pitching angles.
- Refer the following RSSI figure to calculate the RSSI; repeat the above until the expected level is achieved.
- Don't adjust the two terminal's antenna in the same time.
- For the long distance links and heavy attenuation areas, we advise that adjustment is done between 10 am and 4 pm.

6.5.2 RSSI—Receive Level Relationship

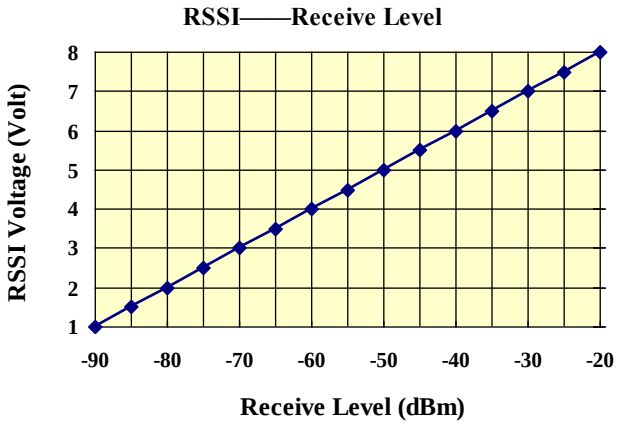


Fig. 452 RSSI—Receive Level Relationship

6.6 Equipment Setup

6.6.1 Power on

- When the ODU/IDU pair is powered up together, the IDU front panel "CABL" LED will light up while the system performs its self-diagnosis. When self-diagnosis is finished, the LCD will display as follows:

DIGIT MICROWAVE PDH-SGT-LPN

6.6.2 Setting

This setup routine only needs to be performed when an IDU/ODU pair is first powered up together. The follow setup procedures are run using the LCD panel: no computer and network management system is needed. Several parameters need not be configured.

6.6.2.1 Login

After powering up the SGT-LPN, the front panel will display: **DIGIT MICROWAVE PDH-SGT-LPN** .

Press ENT for 5 seconds will display: **TYPE IN PASSWORD : _** .

Enter password "AAA". If the user does not login, the parameters can still be checked, but cannot be modified or set (adjusted).

Use IDU panel ▲ ▼button, until the first symbol A displays, press → to ready set the second.

Use IDU panel ▲ ▼button, until the second symbol A displays, press → to ready set the third.

Use IDU panel ▲▼button, until the third symbol A displays, press ENT to finish login, go back to display:

DIGIT MICROWAVE PDH-SGT-LPN.

Note: After login, the SGT-LPN will log out automatically after a period of inactivity that is longer than 30 minutes.

6.6.2.2 Device ID Code

When the panel displays

```
DIGIT MICROWAVE
  PDH-SGT-LPN
```

press ENT on the IDU until the panel displays

```
Version: 1.00
Local ID：123
```

press ENT, ◄ ► ▲ ▼to select a different link ID code in the range 1-255. Press ENT to set the link ID code.

6.6.2.3 Standby Mode Setup

Press ▲▼◄ ► buttons to lead to:

```
1.INFOR 2.SET
3.MORE 4.DEBUG
```

, move cursor to **SET** item, press ENT to **SET** menu, press ▼ to find standby mode setup screen :

```
Local Protect
Auto HS ReA TrB
```

If the system is a 1+0 system and the IDU is using a Modem B card, the suggestion is to use the MANU FD ReB config. If the system is a 1+1 system, the system can be set to FD or HS (the setting depends on what is needed.) When adjusting the antenna, set to MANU mode first, then set to Re or Tr based on the requirement. After installation, set to AUTO mode.

6.6.2.4 Capacity Configuration

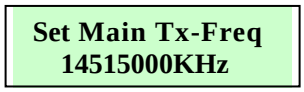
```
Set Rate（x2M）
   16xE1
```

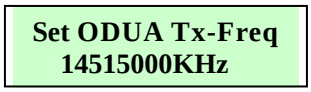
, press **ENT** to modify capacity, press ▲ or ▼ to modify:

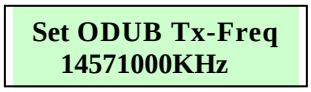
For 8E1 service card, set to 2×E1, 4×E1 or 8×E1;
For 16E1, two 8E1 service cards are needed. After choosing capacity, press **ENT** to confirm the modification.

6.6.2.5 Transmit Frequency

Press ▲ ▼ ◄ ► to find the frequency setting menu:

HS mode 

, FD mode 

and 

. Press ENT to enter into the setting mode; Set the Tx frequency, press **ENT** to confirm settings; Rx will automatically follow Tx to change its frequency.

6.6.2.6 Transmitting Power (Po)

Press▲ ▼ ◄ ► button to find the power setting menu:

,

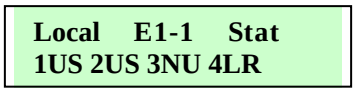
Press ENT to enter the setting mode; press ◄ ► to choose the dBm power menu, press ENT to proceed to Po setting. Press ▲ ▼ to modify Po. Press ENT to finish.

Press ◄ ► to select the ON/OFF power switch menu; press ENT to proceed to the setting mode; change switch to ON and press ENT to activate the power output.

6.6.2.7 E1 Service Interface Status Configuration

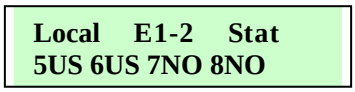
If the user does not need to monitor the E1 signal and link, jump to **6.5.2.8**.

Press ▲ or ▼ to find the service interface setup screen:



.

Press ◄ ► to find the slot and port:



Press **ENT** to proceed to set mode, press ► to choose 1~4 port or 5~8 port to modify.

Press ▲ or ▼ to modify the use status: choose **US (used)**, choose **NU (non-use)**, choose **(loop back to remote site)**, choose **LL (loop back to local site)**; after that press **ENT** to finish.

By choosing US, the port must be connected to a wire, or alarms will occur.

Press ◄ ► to choose the E1 port in a different slot to be modified.

6.6.2.8 Link Installed

In conclusion, the installation is finished. There should be no BER during 24hrs. If everything is normal, the link can then be put into test-running mode.

7 Maintenance and Faults

7.1 General

This section describes the methods for fault analysis, fault location and how to deal with them. By using alarm indicators (LED, LCD flash) and loop back tests, the user can quickly find the fault point, improve MTBR and system availability.

7.2 Maintenance

- Inspect power supply (-48V ±20%)
- Inspect indicator LED
- Inspect IF cable connection from IDU to ODU
- Inspect fixing of the antennas (whether they are flexible and movable)
- Inspect path condition changes

7.3 Alarm description

- **Tributary loss alarm**

This alarm occurs at the tributary input port. When there is an input signal loss at the port, there will be an alarm. If there is an alarm, first inspect the connection cable associated with that port.

- **Service card alarm**

These alarms occur for a service card. There are different alarms associated with different service cards. The E1 service card will produce E1 multiplex alarms as follows:

RAD: remote alarm.

AIS: all "1" alarm.

GLOS: group loss alarm.

If the alarms are appearing simultaneously and disappearing simultaneously, set the baseband frequency loop back and IF loopback. If the alarm does not disappear, the user needs to change service card.

- **Remote alarm**

To deal with this alarm, check and fix what is wrong at the remote equipment site.

- **Frame loss alarm**

This alarm's condition are IF frame loss or IF frame synchronization loss. When this alarm appears, these possible problems should be considered: is traffic with the remote Terminal normal? Is there power to the remote Terminal? Is there a problem with the ODU cable connection? Is there a problem with the remote Terminal's service card connections? If the equipment performs as expected, it should be considered if there is a deep fade in the transmission path which is influenced by strong rainfall, a sandstorm etc. If this alarm appears frequently, it should be considered that the fade margin for the project design may not be acceptable.

- **BER alarm**

This alarm condition indicates the received BER has exceeded the preset Alarm threshold. Generally, this alarm acts together with another alarm (for example, remote transmit power alarm). If there is no another alarm, it should be considered if there is a deep fade in the transmission path which is influenced by strong rainfall, a sandstorm etc. If this alarm appears frequently, it should be considered that the fade margin for the project design may not be acceptable.

- **Cable failed alarm**

This alarm condition indicates that communication between the IDU and ODU has failed. After it is active, the user cannot query the ODU's information. In this case, first check the status of the radio traffic. If the link traffic is running as expected and if the IF Rx AGC is about 3V, then the problem may be communication between the IDU and the ODU. The way to solve this problem is to replace the relevant unit.

Probably, this problem may be due to bad contacts within the IF cable (and there will be other alarms). There can be several suspected problems: First, check the TNC connector? Is the core wire of the TNC oxidized? Is the IF cable short or open circuit? The inspection method is as described below:

1) Disconnect power to the IDU
2) Disconnect IF cable from IDU and only connect to the ODU; then check the impedance of the IF cable.

Impedance 1MΩ~10 MΩ is normal

Impedance ＜1MΩ is a short circuit

Impedance ＞10MΩ is an open circuit

- **Transmit power alarm:**

This alarm indicates the ODU power output is lower than the specified threshold. Inspection is as below:

1) Confirm power output has the ON status
2) Inspect the alarm threshold setting value
3) Turn off remote ATPC; the power output level will return to the set value. If it is still the old value, there can be a fault in the remote ODU Rx or the local power Tx. If the Tx power can't be changed, replace the local ODU.

- **Tx frequency unlock:**

This alarm indicates that the ODU Tx IF local oscillator PLL is unlocked. Replace the ODU.

- **Rx frequency unlock:**

This alarm indicates that the ODU Rx IF local oscillator PLL is unlocked. Replace the ODU.

- **RF local oscillator unlock:**

This alarm indicates that the ODU RF local oscillator PLL is unlocked. Replace the ODU.

- **Receive level low alarm**

This alarm indicates that the Rx level is lower than the threshold. In this case, the problem solving method includes inspection of the receive level, inspect the alarm threshold, inspect the ATPC setting, inspect the remote TX power, inspect antenna orientation, inspect path loss and relevant fade, etc.

- **Temperature alarm**

This alarm indicates the radio's internal temperature is more than the specified operating temperature. Check environment temperature, checking equipment operating status.

- **Voltage alarm**

This alarm indicates the radio inner power is unusual; check the power supply and equipment operating status.

7.4 Failure Determination And Fault-location

7.4.1 LED & LCD of IDU Alarm Display

- **LED indicator**

Refer to 4.1

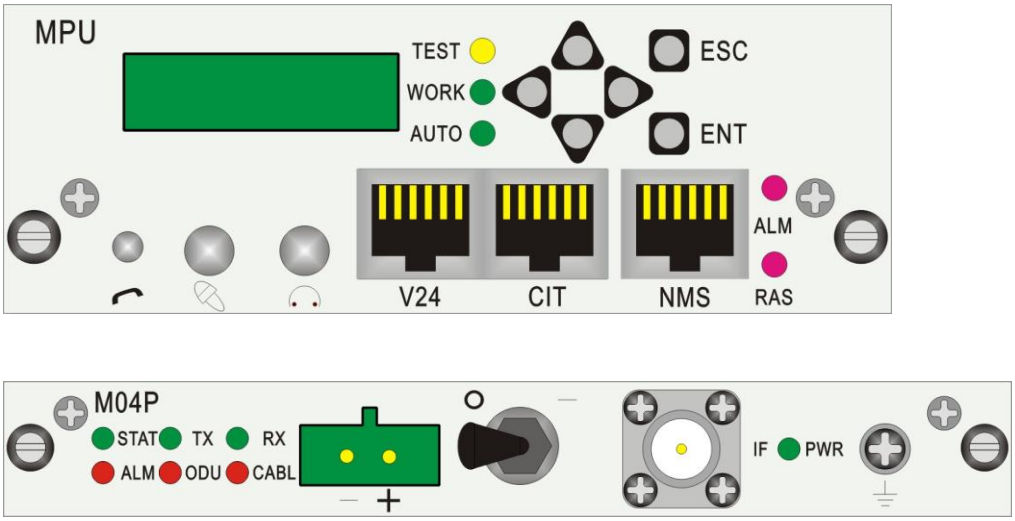


Fig. 53 LED and LCD Illustration

- **LCD indicator**

Parameters shown on the LCD: Refer to User Manual Chapter 4. When several alarms occur at the same time, the alarm display follows a sequence; 1 is the highest alarm level. When alarms occur, the LED will light up, no matter being a higher level or lower level.

Table 26 LCD alarm parameter

LCD parameter	Alarm condition	Level	LED
Bad Slot Alarm SC1 SC4	Service card in position but failure	1	ALM in MPU board
Bad Modem Alarm ModemA ModemB	Two Modem board failures	2	ALM in MPU board
Bad Modem Alarm ModemA	Modem in position but failure	3	ALM in Modem board
Local A Mod Lock Tx:L Rx:L DM:N	Modem lost lock	4	ALM in Modem board
Local A Mod Stat FLS	Demodulation frame lost in Modem	5	ALM in Modem board

Local ODU Lock RF:L Rx:L Tx:N	ODU frequency TX PLL un-locked	6	ODU
I2C Chip Error U8 U9 BDM	I2C operation not-normal	7	ALM in MPU board
Local Supply 5V:4.72 LDO:2.67	IDU internal voltage error>±10%	8	ALM in MPU board
Local E1-1 Alm 1FLS 2TLS3FLS4FLS	Service card frame lost alarm	9	ALM in MPU board
Local E1-1 Alm 1 2TLS3RAS4	Service card E1 remote alarm	10	RAS
Local E1-1 Stat 1IN 2LS 3NU 4LR	E1 set as US but lost signal	11	ALM in MPU board
Local Err Rate 1.40E-06	Link BER rate larger than threshold	12	ALM in MPU board
Local A Mod BER 1.40E-06	Modem BER rate larger than threshold	13	ALM in Modem board
Local ODU RSSI - 90dBm	RF receive level less than threshold	14	ODU
Local ODU RFPo + 03dBm	RFPo level less than threshold	15	ODU
Local A ODU Temp 45°C	-35°C>ODU internal temp.>80°C	16	ODU
Local Unit Temp O:040°C I:038°C	-20°C>IDU internal temp.>70°C	17	ALM in MPU board
	No transmission signal between IDU and ODU	18	CABL
	ALM in remote MPU light	19	RAS

There are two methods which make the LCD screen display multiple alarms:

1. Refer to chapter 4, set jump screen switch as on; when an alarm occurs, screen will display the alarm page, but, when multiple alarms undergo a series of intermittent occurrences, it will be very difficult to catch them.

2. Jump screen switch set as off; press ESC to go back to the home page, then press ENT. When an alarm occurs, it will change to an alarm page but only change once. When another alarm occurs, it will not change the page again.

7.4.2 Loopback test

Fault location by means of loop back test which includes local loopback and remote loopback.

7.4.2.1 Local loopback

- **Local IF loopback**

Local IF loopback; the objective is to check the IDU's operating status.

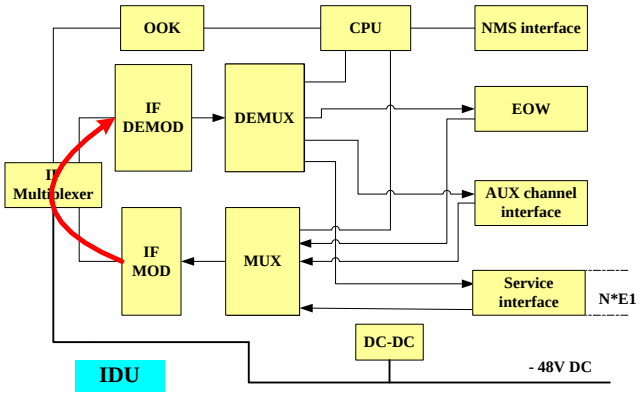


Fig.54 Local IDU IF loop back

- **Local frame loopback**

Local frame loopback; the objective is to inspect if the frame can be looped locally without errors.

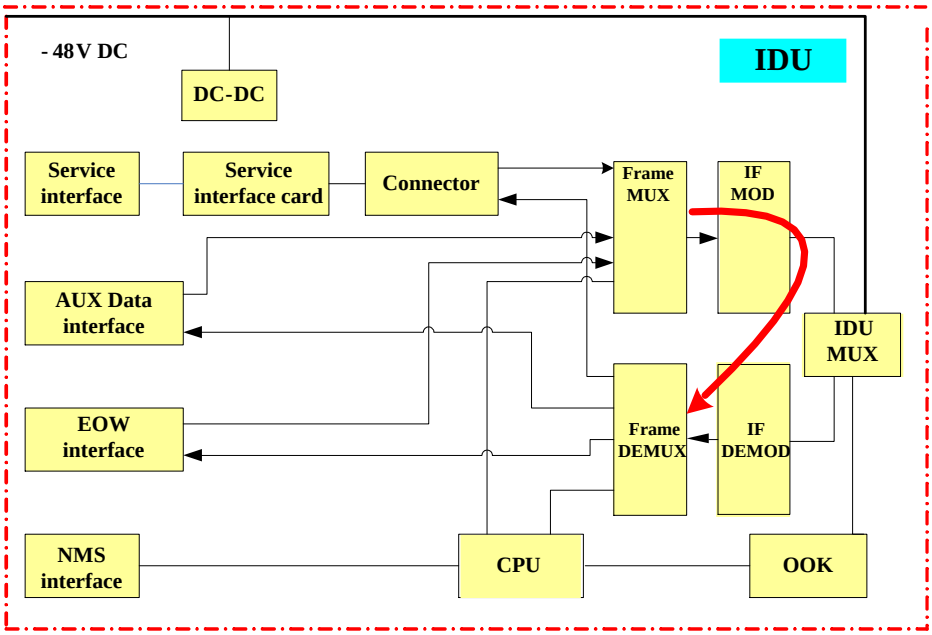


Fig.55 Local Frame Loopback

- **Local Baseband Port Loopback**

Local baseband port loopback; the objective is to inspect if the connection of the service card is fine.

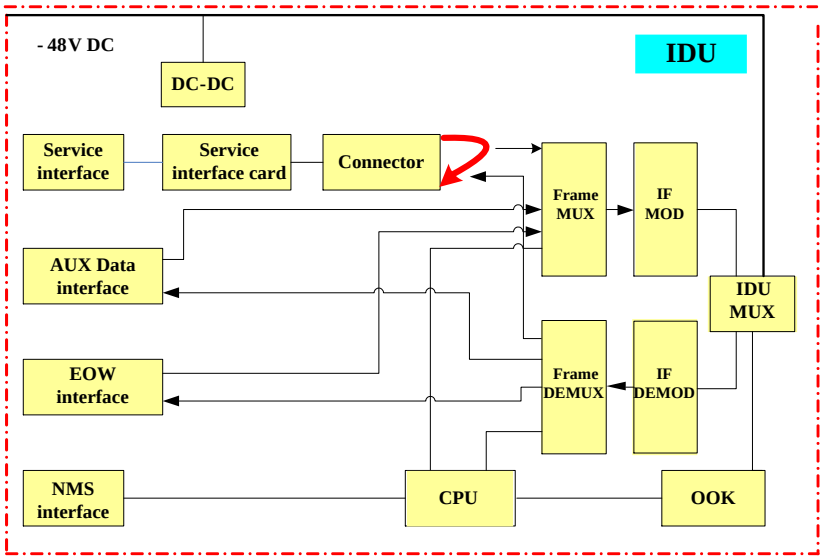


Fig.56 Local Baseband Loopback

7.4.2.2 Remote tributary loopback

Loop from remote tributary; the objective is to inspect total link traffic, including the end Terminal, antennas, feed cables and path loss.

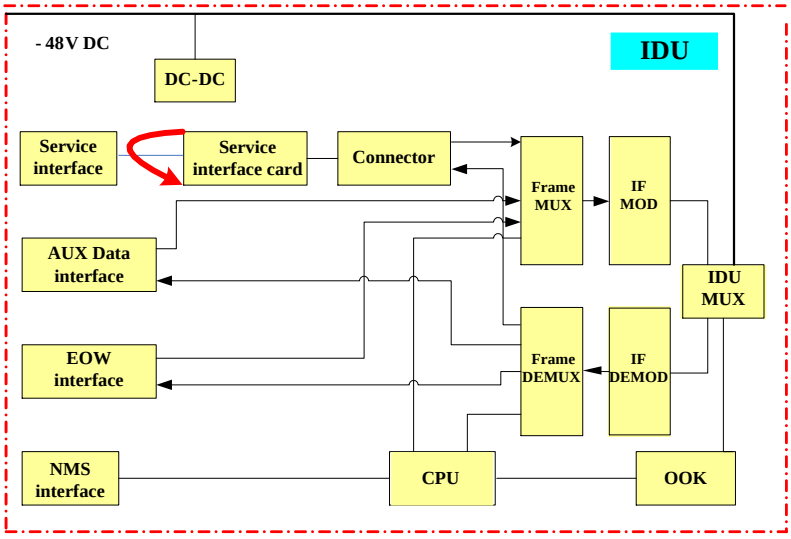


Fig.57 Remote Tributary Loopback

7.4.3 Guideline for Fast Fault-Location

Table 27 Fast Fault Location list

Failure item	LED	LCD	Trouble shooting	Solution
E1 signal lost	MPU-ALM	Local E1-1 SIG 1IN 2LS 3NU 4LR	SC8E1	1 Check E1 connection 2 If no connection set as NU
Service card alarm	MPU-ALM	Local Alarm E1-1 1FLS2 3 4	SC8E1	PORT loopback, if still alarming, change service card, or maybe other problem.
Frame lost	MPU-ALM	Local Alarm E1-1 1FLS2 3 4	Cannot receive or synchronization	1 Check link 2 Check two site's capacity, frequency etc.
Remote alarm	RAS	Local Alarm E1-1 1RAS2 3 4	Remote alarm	Check remote site
BER alarm	MPU-ALM	Local Err Rate 1.40E-06	BER larger than threshold	1 Influenced by environment 2 Check receive level and loop back test with BER instrument
Cable failure alarm	CABL		Cable and ODU	Check cable, connectors and ODU
RFPo alarm	ODU	Local ODU RFPo + 05.2dBm	RFPo lower than threshold	Turn off ATPC, check transmit and receive signals for both sites
RFTx lost lock RFRx lost lock RF local oscillation lost lock	ODU	Local ODU Lock RF:L TX:N RX:N	ODU	1 Check frequency settings 2 Change ODU
RF receiving level alarm	ODU	Local ODU RSSI - 28dBm	RF receive level lower than alarm threshold	Check environment, remote RFPo, antenna, ATPC etc.
IDU temp. alarm	IDU	Local Unit Temp O:040℃ I:038℃	IDU temp. over threshold	1 Improve temp. 2 Check IDU
IDU inner voltage	IDU	Local Supply 5V:4.95	Modem, MPU Voltage	1 Check power supply

alarm		LDO:2.67	error >10%	2 Change respective board
WORK abnormal	WORK		Flash 1 time per sec.	Change IDU
TEST LED permanently on	TEST		Have loopback test active	1 Check if there is a loopback on local site 2 Check if there is a loopback on the remote site
PWR off			If cannot power on, there can be a power supply failure	Check supply voltage, check positive and negative polarity.
LCD no display			Delay power-off LCD protection	Press ESC two times or power on and off, if still have a problem, the problem is in IDU
Lost remote data			Remote data is "x"	1 Check connection for the path 2 Check capacity of both sites 3 Both sites ID number must be different 4 Cancel loop back test
Read nothing from ODU			ODU data is "x"	1 IDU and ODU should match 2 Check cable 3 Check IDU voltage output.

8 Packing, Marking, Transport, Storage

- Packed material and packing method must comply with relevant requirements.
- Symbol items should be in reasonable positions - items include manufacturer name, product name, product type, product No., date of manufacture.
- User Manual, packing list will be enclosed in the packing case.
- Transport by railway, highway, air should prevent the link from being affected by wind, rain and snow.
- Equipment should be stored in dry and ventilated storage facilities. Storage temperature should be in the range -10~+40°C. Storage humidity should not exceed more than 85%. There should be no acid, alkali and corrosive gas in the storage area.